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HYPOGLYCEMIC AND HEPATOPROTECTIVE EFFECT OF *MERREMIA VITIFOLIA* IN MICE

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ABSTRACT: Traditionally, *Merremia vitifolia* meets multipurpose medicinal uses in tribal areas. Therefore, the study worked on hypoglycemic and hepatoprotective effects on animal models to meet the research gap on this plant. Methanolic stem extract at 200 mg/kg and 400mg/kg were administrated orally to determine the effects on blood glucose and hepatic enzymes. The highest dose showed a significant ($p < 0.01$) reduction in blood glucose. Maximum glucose level reduction (52.1%) was observed at 400 mg/kg extract with 3.5±0.6 mmol/L after 3 h, while reference glibenclamide (10mg/kg) reduced 25.2% with 4.4±0.8 mmol/L. The plasma levels of alkaline phosphatase, alanine aminotransferase, and aspartate aminotransferase of CCl_4 intoxicated mice were 108.8, 43.4, and 268.8 IU/L at 400 mg/kg, where the values for reference silymarin (100 mg/kg) were 103.4, 54.3, and 237.7 IU/L, respectively. The reduction of alkaline phosphate and alanine aminotransferase levels were moderately ($p<0.01$) and minimally ($p<0.05$) significant at concentration 400 mg/kg, respectively. Therefore, the study explored the plant's potential hypoglycemic and hepatoprotective effects, where the hypoglycemic effect was strongly significant.

INTRODUCTION: Traditional herbal medicine has a long history to use for hypoglycemic effects and hepatoprotective effects all over the world [1, 2]. A study describes the uses of 800 and 150 plants in Mexico and India for hypoglycemic effects, respectively. It is considered that the plant metabolites contain active compounds that reduce blood glucose levels by the following mechanisms, such as stimulating endogenous insulin release or drop of sugar absorption or improving insulin sensitivity [3].

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On the other hand, traditional natural products convey any probable modes of hepatoprotection, including immunomodulation, stimulation of reductive enzymes, modulation of hepatic DNA synthesis, lipid accumulation Suppression, and reduction of hepatic fibrosis [4, 5].

A study included 509 species belonging to 140 genera that exhibit significant anti-diabetic activity [6]. *Ficus benghalensis* [7], *Momordica charantia* [8], *Ficus hispida* [9], *Ficus elastic* [10] and *Pterocarpus marsupium* [11] are some prominent traditional medicines used for the treatment of diabetes. Another study enlisted 100 medicinal plants clinically proven for hepatoprotective effects [12] and some of the significant plants are *Phoenix dactylifera* [13], *Aquilaria agallocha* [14] and S*alix caprea* [15].

The genus *Merremia* of over 100 plants belongs to family Convolvulaceae and is an abundant source of structurally varied phytochemicals with medicinal potential [16]. Additionally, its species meet nutrition values up to a safety level and are prohibited from chronic and prolonged administration to humans as well as animals [17]. Some therapeutically valuable *Merremia* plants are *M. borneensis, M. emarginata, M. mammosa, M. peltate, M. tridentate,* and *M. vitifolia* [18–20]. The plants provide a wide spectrum of activities, including antimicrobial, analgesic, anticancer, antidiabetic, hepatoprotective activities. Specifically, *M. mammosa* and *M. tridentate* for antidiabetic activity [21, 22], *M. emarginata* for hepatoprotective action [23]. *Merremia vitifolia* is a perennial and climbing plant widely distributed in South and East Asia. Its leaf and rhizome are mainly used in tribal areas to treat fever, inflammation, rheumatism, jaundice, dysentery, and urinary diseases [24–26]. Nevertheless, only a few studies on the plant are available. A recent study revealed the substantial antioxidant, thrombolytic, and anti-nociceptive potential of the methanolic leaf extract [27]. However, no work on hypoglycemic effects was determined on any animal model. Moreover, no evidence of hepatotoxicity or hepatoprotective was presented. As chemical constituents metabolized in the liver and are an essential mark for drug safety, our present aim was to investigate the level of hypoglycemic and hepatoprotective effect of value addition on traditional medicine.

MATERIALS AND METHODS:

Chemicals and Drugs: Analytical grade Methanol (Merck, Germany); Standard Drugs: Glibenclamide and Silymarin (Square Pharmaceuticals Limited, Bangladesh); Dextrose (Glaxo SmithKline Bangladesh).

Experimental Animals: Six-seven weeks old Swiss albino mice of both sexes with a mean body weight of 25 ± 5.0 g were procured from Animal House at the Department of Pharmacy, Jahangirnagar University, Savar, Bangladesh. The animals were fed with a commercial rat pellet diet *ad libitum* during the entire experimental period.

Collection and Identification of the Plant: *M. vitifolia* was collected from Noakhali Science and Technology University, Sonapur, Noakhali and identified by Bangladesh National Herbarium, Mirpur-1, Dhaka. The identification code was DACB46503.

Preparation of Plant Sample: The collected plant stem was dried in the dark for ten days and ground into a coarse powder. Roughly 500g of powder was produced and stored in an airtight container in at cool, dark, and dry place until extraction commenced.

Cold extraction for *M. vitifolia*: The powder was soaked in 1500 ml of 80% methanol at room temperature for two weeks, accompanied by occasional shaking and stirring. Then the solution was filtered using a filter cloth and Whitman filter paper every seven days. The rotary evaporation (Yamato Scientific, Japan) at 45ºC and evaporation at ambient conditions gave nearly 65 g of gummy, concentrate and greenish-black extract. Then, the extract was stored in a refrigerator in a beaker covering it with aluminum foil.

Hypoglycemic Test: A total of four groups of mice (n=10) and equally designed by sex were taken to perform hypoglycemic tests according to the described method with a little bit of modification [28]. For Group I (Control), mice were given only distilled water (10 mL/kg of mouse body weight), while Group II was used as the standard Group and treated with glibenclamide (10mg/kg). Group III and IV were treated with 200 mg/kg of stem extract and 400mg/kg body weight, respectively. Fasting blood glucose measurement followed by immediate administration (p.o.) of test samples. After 1 hour, dextrose (2 g/kg) solution was administered to all groups, and blood was collected from the mouse tail vein after 1 h, 2 h, and 3 h of administration. Glucose concentration was measured by Accu-Check electronic glucometer (Roche, Germany).

Hepatoprotective Effect on CCl_4-induced Mice: The mice were divided into five groups (n = 10) and followed the method described by Li *et al.* [29]. Group I (negative control) animals were administered a single dose of water (25 ml/kg, p.o.) daily for 7 days and received olive oil (8 ml/kg, i.p.) on day 7. Group II (Toxicant control) received water (25 ml/kg, p.o.) once daily for 7 days and received 0.2% CCl_4 in olive oil (8 ml/kg, i.p.) on

day 7. Group III (positive control) received standard drug silymarin (100 mg/kg, p.o.) once daily for 7 days and received 0.2% CCl_4 in olive oil (8 ml/kg, i.p.) on day 7. Groups IV–V were administered orally 200 & 400 mg/kg of the extract once daily for 7 days, respectively. The Groups III–V animals were simultaneously administered 0.1% CCl_4 in olive oil (8 ml/kg, i.p.) on day 7 after 2 h of the silymarin and extract administration. Animals were sacrificed after 24 h of treatment, and blood was collected through cardiac puncture, and the serum was separated by centrifugation at 6000 × g for 15 min. Liver function biochemical markers alkalinephosphatase (ALP) levels, alanine aminotransferase (ALT), and aspartate aminotransferase (AST) were evaluated according to the supplier's specifications from the standard kits.

Statistical Analysis: Data are expressed as mean ± standard error of the mean (SEM) and analyzed using the Statistical Package for the Social Sciences (SPSS), version 20.0 software. The difference between group means was analyzed with a one-way analysis of variance (ANOVA) followed by Dunnet 't' test. P <0.05 was considered as statistically significant.

RESULTS:

Hypoglycemic Effects: The blood glucose levels of all groups were nearly 7 mmol/L before 1 hr of administration. In contrast, several changes were observed in all administrations except control **Table 1.** After 1 hr of administration, both standard and extracts showed a minute decrease of glucose level, and the most minor reduction was exhibited by the standard at 6.5±0.5 mmol/L. In 2nd hour, the standard also exhibited the lowest glucose level, although MV 400 had a substantial fall of that level with 5.6±0.8 mmol/L. Dramatically, in 3rd hour, MV 400 showed a significant decrease ($p<0.01$) in glucose level, where it surpassed the hypoglycemic effect of glibenclamide (10mg/kg) and reached the maximum reducing figure at 3.5±0.6 mmol/L. At that end point, MV 400 exhibited 52.1 hypoglycemic effect compared to the blood glucose level before administration.

TABLE 1: EFFECT OF METHANOLIC STEM EXTRACT OF *M. VITIFOLIA* ON BLOOD GLUCOSE LEVEL (MEAN ± SEM)

Treatment	Blood Glucose Concentration (mmol/L)			
	-1 Hour	+1 Hour	+2 Hour	+3 Hour
Control	7.0±0.5	7.1±0.5	7.4±0.2	7.2±0.3
Standard	7.0±0.4	6.5±0.5	5.1±0.6	4.4±0.8*
MV200	7.3±0.4	7.1±0.5	7.0±0.4	5.7±0.5
MV400	7.2±0.4	7.1±0.6	5.6±0.8*	3.5±0.6**

Here, MV stands for methanol extract of *M. vitifolia*; *p<0.05; **p<0.01

Hepatoprotective Test: The results of the hepatoprotective effect of extracts on CCl_4-intoxicated rats are shown in **Table 2**. As indicated from the results, CCl_4-intoxicated animals showed an increase in the alkalinephosphatase, alanine aminotransferase, and aspartate aminotransferase levels compared to the negative control group. Treatment of animals with *M. vitifolia* at 200 and 400 mg/kg, p.o., or silymarin 100 mg/kg, p.o., significantly decreased the level of serum marker enzymes.

TABLE 2: PROTECTIVE EFFECT OF *M. VITIFOLIA* AND SILYMARIN ON CARBON TETRACHLORIDE (CCL_4) INDUCED ELEVATION IN ALKALINEPHOSPHATASE, ALANINE AMINOTRANSFERASE, AND ASPARTATE AMINOTRANSFERASE LEVELS (MEAN ± SEM)

Group	Alkaline phosphatase (IU/L)	Alanine aminotransferase (IU/L)	Aspartate aminotransferase (IU/L)
Negative Control	188.2±15.6	55.9±10.0	274.0±66.8
Toxicant Control	204.2±22.9	63.7±14.2	327.0±36.1
Positive Control	103.4±21.7**	54.3±8.3	237.7±45.6*
MV200	188.6±27.0	54.3±12.4	282.7±30.7
MV400	108.8±15.3**	43.4±4.0*	268.8±59.9

Here, MV stands for methanol extract of *M. vitifolia;* *p<0.05;**p<0.01

M. vitifolia at 400 mg/kg exhibited 108.81±15.3 IU/L of ALP concentration, almost a 50% decrease from the toxicant control group. Alanine aminotransferase concentration showed surprising results;400 mg/kg dosehad a value of 43.4±4.0 U/L, whereas positive control provided a higher value of 54.3±8.3 IU/L. Regarding aspartate aminotransferase level, 400 mg dose also showed the least value between the two concentrations, and positive control exhibited the least among all groups. The reduction of alkaline phosphate and alanine aminotransferase levels were moderately ($p<0.01$) and minimally ($p<0.05$) significant at concentration 400 mg/kg, respectively.

DISCUSSION: The study determined the hypoglycemic and hepatoprotective effects of the methanolic extract of the stem of *M. vitifolia* on mice models. Upon administration of the extract with two concentrations, the results showed a significant lowering of blood glucose and liver enzyme levels that marked potential phytoconstituents at the plant metabolite.

Empirically, the people in Luwu, Southern Sulawesi, use *M. vitifolia* to cure diabetes mellitus (Hasanah *et al.,* 2019). However, the 400 mg/kg dose surpasses the blood glucose level for 10 mg/kg glibenclamide in this study. Although no in vivo activity on hypoglycemic activity is available, one study on n-hexane extract of the plant leaves showed the inhibition of α-glucosidase, which is associated with glucose absorption inhibition by the intestinal epithelium membrane. Phytol, neophytadiene, β-caryophyllene, stigmasterol, γ-sitosterol, and lup-20(29)-en-3-one probably contribute to α-glucosidase inhibitory activity [31]. Some plants under the genus *Merremia* also exhibited hypoglycemic activity. A study confirmed the potent antidiabetic activity of *M. emarginata* in streptozotocin-induced diabetic rats. The enzymatic activities for carbohydrate metabolism were significantly increased; however, glucose-6-phosphatase, fructose-1, 6-bisphosphatase were significantly decreased, and interestingly it showed the pancreatic β-cells regeneration in this study [32]. Another study described that flavonoid-rich fraction of *M. tridentata* revealed strong hypoglycemic effects in alloxan-induced diabetic mice compared with the references, glibenclamide, and metformin. At the same time, the plant exhibited good α-amylase and α-glucosidase inhibitory activity compared with acarbose [33]. The root extract of *M. tridentate* also possessed significant antidiabetic activity in streptozotocin (STZ)-induced diabetic rats [34]. Another Merremia species *M.mammosa* exhibited wound healing in a diabetic rat model [35].

In the case of hepatoprotective effects against CCl_4 intoxicated mice, alkalinephosphatase, alanine aminotransferase, and aspartate aminotransferase levels were decreased significantly. Additionally, the ingestion of the plant extracts reduced comparatively enlarged intoxicated liver size. However, a recent study on a genus of the plant explored that *M. tridenta* ameliorated the liver damage caused by the CCl_4 and reduced serum aspartate aminotransferase, alanine aminotransferase, alkalinephosphatase, acyl carrier protein and total Bilirubin content to normal levels [36]. Another species showed a hepatoprotective effect, where four out of ten elevated enzymes level by CCl_4 were significantly reduced upon administration of *M. borneensis*. Moreover, pretreatment with *M. borneensis* against rats treated with CCl_4 showed hepatic enzymatic and non-enzymatic antioxidant molecules in increased level, and histopathological improvement, substantially [37].

One recent study confirmed the isolation of 27 phytochemicals in this plant and some proposed compounds are azedarachin C, stigmastan-3,6-dione, pheophorbide A, and isoquinaldonitrile, 3-methyl-, 2-oxide, however, comprehensive bioactivity testing had not been done on these compounds [25]. The present finding must keep a query for extensive investigation on the plant's phytochemicals that exactly impart in these actions.

Limitation of this Study: The study evaluated the pharmacological insight on hypoglycemic and hepatoprotective effects only that is not enough for the plant's therapeutic profiling. It should take more than two doses to determine the dose-response relationship meaningful. Moreover, no hint can be conveyed about the molecules responsible for the two pharmacological aspects.

CONCLUSION: The study is the scientific evidence of hypoglycemic and hepatoprotective

activities of *M. vitifolia* that justify the ethnopharmacological diversity of the plant. Although plant extract exhibited less significant hepatoprotection, it may be highlighted for antidiabetic activity as an alternative medicine.

Declaration:

Ethical Issue: The ethical committee, Faculty of Science of Noakhali Science and Technology University, Bangladesh, had approved the research with the code: NSTU/SCI/EC/2020/132.

Consent for Publication: Not Applicable

Availability of Data and Materials: There has no restriction to sharing any data.

CONFLICTS OF INTEREST: There is no conflict of interest

REFERENCES:

1. Mans DRA: Hypoglycemic activity of plant-derived traditional preparations associated with Surinamese from African, Hindustani, Javanese, and Chinese origin: potential efficacy in the management of diabetes mellitus. Basics of hypoglycemia 2022.
2. Talukder S, Uddin M, Ferdous M and Baral P: Phytochemical screening and bioactivity determination of ethyl acetate and methanolic extracts of leaf and bark of the plant *Nyctanthes arbortristis* L. Eur J Med Heal Sci 2020; 2(6): 245-151.
3. Shapiro K and Gong WC: Natural Products Used for Diabetes. J Am Pharm Assoc 2002; 42(2): 217-226.
4. Madrigal-Santillán E, Madrigal-Bujaidar E, Álvarez-González I, Sumaya-Martínez MT, Gutiérrez-Salinas J, Bautista M, Morales-González Á, y González-Rubio MG, Aguilar-Faisal JL and Morales-González JA: Review of natural products with hepatoprotective effects. World J Gastroenterol 2014; 20(40): 14787.
5. Ali M, Khan T, Fatima K, Ali QU, Ovais M, Khalil AT, Ullah I, Raza A, Shinwari ZK and Idrees M: Selected hepatoprotective herbal medicines: Evidence from ethnomedicinal applications, animal models, and possible mechanism of actions. Phyther Res 2018; 32(2): 199-215.
6. Salehi B, Ata A, V. Anil Kumar N, Sharopov F, Ramírez-Alarcón K, Ruiz-Ortega A, AbdulmajidAyatollahi S, ValereTsouhFokou P, Kobarfard F, Amiruddin Zakaria Z and Iriti M: Antidiabetic potential of medicinal plants and their active components. Biomolecules 2019; 9(10): 551.
7. Gayathri M and Kannabiran K: Antidiabetic and ameliorative potential of *Ficus bengalensis* bark extract in streptozotocin induced diabetic rats. Indian J Clin Biochem 2008; 23: 394-400.
8. Reyes BA, Bautista ND, Tanquilut NC, Anunciado RV, Leung AB, Sanchez GC, Magtoto RL, Castronuevo P, Tsukamura H and Maeda K: Anti-diabetic potentials of *Momordica charantia* and *Andrographis paniculata* and their effects on estrous cyclicity of alloxan-induced diabetic rats. J Ethnopharmacol 2006; 105(1-2): 196-200.
9. Shahreen S, Banik J, Hafiz A, Rahman S, Zaman AT, Shoyeb A, Chowdhury MH and Rahmatullah M: Antihyperglycemic activities of leaves of three edible fruit plants (*Averrhoa carambola*, *Ficus hispida* and *Syzygium samarangense)* of Bangladesh. African J Tradit Complement Altern Med 2012; 9(2): 287-291.
10. Al Hilfi ZA, Nencu IO, Costea T, Gird CE, Stoicescu CS, Anghel AI and Negres SJ: Chemical composition and antioxidant activity of *Ficus elastic* Roxb. ex Hornem and *Raphanus sativus* L. selective dry extracts with potential antidiabetic activity. Farmasia 2019; 67: 5.
11. Dhanabal SP, Kokate CK, Ramanathan M, Kumar EP and Suresh B: Hypoglycaemic activity of *Pterocarpus marsupium* Roxb. Phyther Res 2006; 20(1): 4-8.
12. Okaiyeto K, Nwodo U, Mabinya L and Okoh A: A review on some medicinal plants with hepatoprotective effects. Pharmacogn Rev 2018; 12(24): 186-199.
13. Al-Qarawi AA, Mousa HM, Ali BH, Abdel-Rahman H and El-Mougy SA: Protective effect of extracts from dates (*Phoenix dactylifera* L.) on carbon tetrachloride-induced hepatotoxicity in rats. Int J Appl Res Vet Med 2004; 2(3): 176-180.
14. Alam J, Mujahid M, Jahan Y, Bagga P and Rahman MA: Hepatoprotective potential of ethanolic extract of *Aquilaria agallocha* leaves against paracetamol induced hepatotoxicity in SD rats. J Tradit Complement Med 2017; 7(1): 9-13.
15. Wahid A, Hamed AN, Eltahir HM and Abouzied MM: Hepatoprotective activity of ethanolic extract of Salix subserrata against CCl 4-induced chronic hepatotoxicity in rats. BMC Complement Altern Med 2016; 16: 1-10.
16. Staples G: A Checklist of *Merremia* (Convolvulaceae) in Australasia and the Pacific. Singapore Botanic Garden, 2010.
17. Olatunji TL, Adetunji AE, Olisah C, Idris OA, Saliu OD and Siebert F: Research progression of the genus merremia: A comprehensive review on the nutritional value, ethnomedicinal uses, phyto-chemistry, pharmacology, and toxicity. Plants 2021; 10(10): 2070.
18. Kim HR, Chung SY, Jeong YH, Go EJ, Han AR, Kim NH, Sung MK, Song GN, Jang JO, Nam JW and Lee HJ: P-glycoprotein inhibitory activity of Indonesian medicinal plants in human breast cancer cells. Nat Prod Sci 2004; 10(6): 268-271.
19. Perez KJB, Jose MAI, Aranico E and Madamba M: Phytochemical and antibacterial properties of the ethanolic leaf extract of *Merremia peltata* (L.) Merr. and Rubus spp. Adv Environ Biol 2015; 9(19): 50-56.
20. Hossain MA and Shah MD: A study on the total phenols content and antioxidant activity of essential oil and different solvent extracts of endemic plant *Merremia borneensis*. Arab J Chem 2015; 8(1): 66-71.
21. Ratnadewi AAI, Wahyudi LD, Rochman J, Nugraha AS and Siswoyo TA: Revealing anti-diabetic potency of medicinal plants of Meru Betiri National Park, Jember–Indonesia. Arab J Chem 2020; 13(1): 1831-1836.
22. Karuppusamy A and Parimelazhagan T: Antidiabetic activity of aqueous root extract of *Merremia tridentata* (L.) Hall. f. in streptozotocin–induced–diabetic rats. Asian Pac J Trop Med 2012; 5(3): 175-179.
23. Parkavi S, Ganesh P and Swaminathan C: Phytochemical analysis, antibacterial activity and antioxidant activity of leaf extracts of *Merremia emarginata* (Burm. f). Int J Pharm Sci Res 2020; 10: 5214-5218.
24. Rahman M, Uddin S and Wilcock C: Medicinal plants used by Chakma tribe in hill tracts districts of Bangladesh. Indian J Tradit Knowl 2007; 6(3): 508-517.
25. Tahya CY, Karnelasatri and Gaspersz N: Chemical profiling and histamine inhibitory activity assessment of

Merremia vitifolia and *Bidens pilosa* Extracts. Molekul 2023; 18(1): 117-130.
26. Faruque MO, Uddin SB, Barlow JW, Hu S, Dong S, Cai Q, Li X and Hu X: Quantitative ethnobotany of medicinal plants used by indigenous communities in the Bandarban district of Bangladesh. Front Pharmacol 2018; 9: 40.
27. Akter S, Jahan I, Khatun MR, Khan MF, Arshad L, Jakaria M and Haque MA: Pharmacological insights into *Merremi avitifolia* (Burm.f.) Hallier f. leaf for its antioxidant, thrombolytic, anti-arthritic and anti-nociceptive potential. Biosci Rep 2021; 41(1): 20203022.
28. Joy KL and Kuttan R: Anti-diabetic activity of Picrorrhizakurroa extract. J Ethnopharmacol 1999; 67(2): 143-148.
29. Li C, Yi LT, Geng D, Han YY and Weng LJ: Hepatoprotective effect of ethanol extract from *Berchemia lineate* against CCl4-induced acute hepatotoxicity in mice. Pharm Biol 2015; 53(5): 767-772.
30. Hasanah E, Ayu NK, Puspita D and Sukarti S: Analysis of flavaniod content from extract ethanol bilajangbulu leaf (*Merremia vitifolia*). J Akta Kim Indones 2019; 30: 73-78.
31. Tahya CY and Karnelasatri K: Gas chromatography-mass spectrometry analysis and α-glucosidase inhibitory activity of n-hexane extract of bilajangbulu (*Merremia vitifolia*) leaves. Walisongo J Chem 2021; 4(2): 162-172.
32. Gandhi GR and Sasikumar P: Antidiabetic effect of *Merremia emarginata* Burm. F. in streptozotocin induced diabetic rats. Asian Pac J Trop Biomed 2012; 2(4): 281.
33. Vo Van L, Pham EC, Nguyen CV, Duong NTN, Vi Le Thi T and Truong TN: *In-vitro* and *in-vivo* antidiabetic activity, isolation of flavonoids, and *in-silico* molecular docking of stem extract of *Merremia tridentata* (L.). Biomed Pharmacother 2022; 146: 112611.
34. Arunachalam K and Parimelazhagan T: Antidiabetic activity of aqueous root extract of *Merremia tridentata* (L.) Hall. f. in streptozotocin–induced–diabetic rats. Asian Pacific J Tropical Med 2023; 5(3): 175-9.
35. Sakinah E, Ulfa E and Marchianti A: The effectiveness of *Merremia mammosa* (Lour.) extract fractions as diabetic wound healers on diabetic rat model 2018.
36. Manimegalai M, Prasad SS, Visvanand R, Subha TS and Suguna L: Hepatoprotective activity of *Merremia tridentata* against carbon tetrachloride induced hepatotoxicity in rats. Indian J Sci Technol 2022; 15(45): 2482-91.
37. Iqbal M, Dawood Shah M, Vun-Sang S, Binti R and Saman A: Hepatoprotective activity of *Merremia borneensis* against carbon tetrachloride (CCl_4)-induced acute liver damage in rats: a biochemical and histopathological evaluation. IJPPS 2020; 12: 41-5.

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