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PHYTOCHEMICAL SCREENING AND ANTIDIABETIC EFFICACY OF BAMBUSA VULGARIS AND NEOLAMARCKIA CADAMBA: A COMPARATIVE STUDY

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ABSTRACT

The comparative analysis of extract of *Bambusa vulgaris* young stem and *Neolamarckia cadamba* root extract's anti-diabetic properties in STZ-induced diabetic rats. To induce Diabetes, provide a single dosage of 50mg/kg i.p. of STZ dissolved in citrate buffer. EEBV, EENC, AEBV and AENC give as a treated drug dose of 100mg/kg body weight individually. Metformin, the conventional medication, is also taken orally as standard drug in dosages of 10mg/kg of body weight. The full pharmacological treatment regimen took place over the course of 35 day. The result showed that all extracts are significantly decrease blood glucose level. Total phenolic content and total flavonoid content were found higher in ethanolic extract *Bambusa vulgaris* (EEBV) then ethanolic extract *Neolamarckia cadamba* (EENC). All extracts are significantly decrease blood glucose level. May be all extracts decreases insulin level in body and career transport GLUT-4 which are insulin dependent transporter and shows significant antidiabetic activity.

KEYWORDS

Diabetes, Bambusa vulgaris, Neolamarckia cadamba, Metformin and Streptozotocin.

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INTRODUCTON

Diabetes is a chronic condition that occurs when the body either cannot produce enough insulin or cannot effectively use the insulin it produces. Insulin is a hormone that regulates blood sugar (glucose), which is vital for energy production. The primary types of Db are Type 1, Type 2 and gestational Db (Aladenika, *et al* 2025)[1]. Db is a growing global epidemic, in the International Db Federation (IDF) estimating that approximately 537 million adults were living in Db in 2021. This number is projected to rise to 783 million by 2045. Two of medicinal plants commonly used in India as

traditionally *Bambusa vulgaris* and second one is *Neolamarckia cadamba*. As a member of the Poaceae family and the Bambusoideae subfamily, bamboo is a very common plant that grows mostly in tropical and subtropical climates between 46°N and 47°S (Maurya, *et al* 2025)[2]. Its applications are many and range from building construction materials, food products and musical instruments to paper pulp, fencing, basketry, water pipes, utensils, bicycles, bridges and low-rise housing (Fobane, *et al* 2024)[3] *Neolamarckia cadamba* (Family-Rubiaceae) commonly called Kadamba enjoys a hallowed position in Ayurveda- an Indian indigenous system of medicine. It is also named as Kadam (Singh, *et al* 2023)[4] *Neolamarckia cadamba* primarily consist of indole alkaloids, terpenoids, sapogenins, saponins, terpenes, steroids, fats and reducing sugars (Yang, *et al* 2024)[5] Kadam are used in treatment of various diseases like fever, uterine complaints, blood diseases, skin disease, tumour, anaemia, eye inflammation and diarrhoea. Other reported uses of kadam are antihepatotoxic, antimalarial, analgesic, anti-inflammatory, antipyretic, diuretic and laxative (Bisoyi, *et al* 2024)[6].

MATERIAL AND METHODS

The study was conducted Department of Pharmacy, Guru Ghasidas Vishwavidyalaya, Koni, Bilaspur (CG). Young Stem of *Bambusa Vulgaris* and Root of *Neolamarckia Cadamba* were collected from near district Raigarh village Behramaar Chhattisgarh. Identification and Authentication of plant samples were done from Botany department of Guru Ghasidas Vishwavidhyalay Koni Bilaspur Chhattisgarh. The material was shade dried and ground to a fine powder. The pulverized *Bambusa vulgaris* young stem (50g each) and *Neolamarckia cadamba* root (50g each) were extracted by Soxhlation using double-distilled water and ethanol, respectively, plant solvent (1:5) w/v for 48 h. Prior to use, the freeze-dried extracts were dissolved in double distilled water (DDW) in desired concentrations for further use (Ansari, *et al* 2024)[7].

Albino rats were randomly selected and kept separately. After 7 days of acclimatization base blood, glucose levels were monitored. The selected animals were divided into 7 groups (n = 6 rats per group). During 5 weeks of experimental protocol all the animals would be fed in high fat diet and need to be divided into the normal group receive saline (1ml/kg/day). The diabetic control group was receiving a single intraperitoneal dose of STZ (50mg/kg i.p.) dissolved in citrate buffer for induction of Db. The blood glucose level of each STZ treated rat needs to be check 3 days after STZ administration. Animals that show blood glucose level above 200mg/dl was considered as diabetic rats. The 4 and 5 test groups received aqueous and alcoholic extract of *BV*. After that 6 and 7 groups received aqueous and alcoholic extract of *NC*. Through oral orogastric tube at dose of 100mg/kg body weight. The volume of administrated extract was 1ml for each animal. The standard drug Metformin also administered orally at doses of 10mg/kg body weight. The entire drug treatment program was done in 35 days of period and different parameters such as blood glucose level, body weight was monitored every day (Madhariya, *et al* 2023)[8], (Wong, *et al* 2024)[9].

Statistical analysis

All the data were expressed as mean ± S.E.M. Statistical analysis was carried out using one-way ANOVA prism pad test. The criterion for statistical significance was $p<0.05$S.

Ethical consideration

Animals and ethical approval Wistar albino rats (140-180g) were procured from the animal house of Guru Ghasidas Vishwavidhyalay, Bilaspur, India (Reg No 999/GO/Re/S/0/CPCSEA).

RESULTS AND DISCOSSION

After performed preliminary phytochemical screening presence of carbohydrates, glycosides, saponins, alkaloids, flavonoids, phenolics and tannins, phytosterols and triterpenoids was detected by qualitative chemical tests conducted on the ethanolic extract of BV young stem. Similarly, the presence of these compounds was detected in the aqueous extract of BV young stem (Acharya, *et al* 2024)[10] Second plant NC root extract in ethanolic form showed the presence of carbohydrates,

glycosides, saponins, alkaloids, flavonoids, phenolics and tannins, phytosterols, and triterpenoids. The NC root extract in aqueous form also showed the presence of these substances (Surani, *et al* 2022)[11].

Estimation of Total Phenol Content

The Folin-Ciocalteu technique was used to assess the total phenol concentration in both ethanolic and aqueous extracts. It was discovered that the ethanolic extract of the young stem of *Bambusa vulgaris* contained 11.23mg/ml of total phenol. The total phenolic content of the juvenile stem of *Bambusa vulgaris* was determined to be 1.165mg/ml in the aqueous extract (Alias *et al*)[12].

Using the Folin-Ciocalteu technique, the total phenol concentration was determined for both ethanolic and aqueous extracts. The ethanolic extract of NC root was discovered to have 1.165 mg/ml of total phenol concentration. The total phenolic content of the NC root aqueous extract was measured at 0.115 mg/ml (Chatterjee, *et al* 2021)[13].

Estimation of Total Flavonoid Content

The total flavonoid content of both ethanolic and aqueous extracts was determined using the Folin-Ciocalteu technique. BV young stem ethanolic extract was found to have 7.7mg/ml of total flavonoids. There were 0.2mg/ml of total flavonoids in the BV young stem aqueous extract (Alias, *et al*)[12].

The Folin-Ciocalteu technique was utilised to assess the total flavonoid concentration in both ethanolic and aqueous extracts. The ethanolic root extract of NC was found to have 1.95mg/ml of flavonoids overall. The total flavonoid content of NC root extract was measured at 0.16mg/ml (Chatterjee, *et al* 2021)[13].

***In-vivo* Study**

Effect on blood glucose level

When compared to the normal group, the Db control group's blood glucose levels were considerably (P<0.001) higher on the third day after receiving STZ treatment. These levels then rose in a time-dependent way from the third day to the fifth week. When compared to the diabetic control group, a five-week oral therapy in an alcoholic extract of BV and NV significantly (P<0.001) decreased the hyperglycemia. In addition, as compared to the diabetic control group, the oral therapy of NC and BV aqueous extract significantly decreased blood glucose levels (P<0.001, P<0.01, respectively) (Sebayang, *et al* 2023)[14].

Effect on body weight

A significant decrease in the body weights (28-33g) of diabetic animals was observed 10 days after induction of streptozotocin into the animals. The oral administration of plant extract markedly increased the body weight of the animals but the effect was not dose dependent.

The ethanolic extract of *BV* and *NV* increases in the body weight at 1^{st}, 2^{nd}, 3^{rd}, 4^{th}, 5^{th} week (P<0.001) as compare to aqueous extract (P<0.05) while that not show any significant difference as compared in the initial body weight (Kottaisamy, *et al* 2021)[15].

In oral glucose tolerance tests, EEBV, EENC, AEBV and AENC give as a treated drug dose of 100mg/kg body weight reduced the amount of blood glucose in experimental animals. At this dose, EEBV, EENC, AEBV and AENC, respectively, decreased blood glucose levels by 145±2.7, 200±1.7, 165±1.5, 195±2.5. Clearly, we can see EEBV, EENC are more efficient as compare to AEBV, AENC. Superficially extract EEBV is most efficiently used as lowering the blood glucose level. A standard antihyperglycemic drug, metformin when administered at a dose of 10 mg per kg body weight, reduced blood glucose levels by 117±4.1. Thus, EEBV at the dose tested showed better antihyperglycemic activity than other three extracts. The results are shown in Table No.1 and Figure No.3 and suggest that EEBV can be used to reduce blood glucose levels in hyperglycemic subjects (Elekofehinti, *et al*, Khandelwal, *et al* 2021)[16,17].

Data were analysed by one way ANOVA followed by Newman-keulis: compare all pair of columns as $^{a}P < 0.05$, $^{b}P < 0.01$, $^{c}P < 0.001$ when compare to group 1 and $^{d}P < 0.05$, $^{e}P < 0.01$, $^{f}P < 0.001$ when compare to group 2 and $^{g}P < 0.05$, $^{i}P < 0.01$, $^{i}P < 0.001$ when compare to group 3 and for test $^{h}P < 0.05$, $^{j}P < 0.01$, $^{k}P < 0.001$.

Body weight parameter also checked during the hyperglycemic treatment sessions; the dose was taken 100mg per kg body weight for EEBV, EENC,

AEBV and AENC. At present dose EEBV, EENC, AEBV and AENC, respectively increase the body weight by 159±3.3, 152±2.4, 159±3.3, 154±2.4 Clearly, we can see EEBV, EENC are more efficient as compare to AEBV, AENC. Superficially extract EEBV is most efficiently used as lowering the blood glucose level and increase the body weight. A standard antihyperglycemic drug, metformin when administered at a dose of 10mg per kg body weight, reduced blood glucose levels by 170±8.6. Thus, EEBV at the dose tested showed better antihyperglycemic activity than other three extracts. The results are shown in Table No.1, Table No.2 and Figure No.3, Figure No.4 and suggest that EEBV can be used to reduce blood glucose levels and increase the body weight in hyperglycemic subjects. Antihyperglycemic activity of the stem-bark extract of Tamarindus indica has been observed in experimentally induced hyperglycemic and normal glycemic Wistar rats. Phytochemical screening revealed the presence of carbohydrates, glycosides, saponins, flavonoids, cardiac glycosides, tannins, alkaloids and triterpenes (Mishra, *et al* 2023, Indira, *et al* 2024)[18,19].

Data were analysed by one way ANOVA followed by Newman-keulis: compare all pair of columns as $^{a}P < 0.05$, $^{b}P < 0.01$, $^{c}P < 0.001$ when compare to group 1 and $^{d}P < 0.05$, $^{e}P < 0.01$, $^{f}P < 0.001$ when compare to group 2 and $^{g}P < 0.05$, $^{i}P < 0.01$, $^{i}P < 0.001$ when compare to group 3 and for test $^{h}P < 0.05$, $^{j}P < 0.01$, $^{k}P < 0.001$.

Table No.1: Estimation of blood glucose level

No.of weeks	Normal	Diabetic control	Standard Metformin	Test 1 EEBV	Test 2 AEBV	Test 3 EENC	Test 4 AENC
1st	117±13	375±11	128±6.2	148±5.3	256±3.8	178±5.2	285±3.7
2nd	115±11	350±9.0	130±6.7	165±5.0	267±4.5	175±4.4	265±4.3
3rd	120±11	340±9.0	125±6.1	156±4.6	250±4.0	168±4.2	255±4.2
4th	118±11	345±9.3	120±5.4	155±3.7	230±3.1	166±3.4	235±3.5
5 th	122±11	340±9.5	117±4.1	145±2.7	200±1.7	165±1.5	195±2.5

Table No.2: Effect on body weight

No. of weeks	Normal	Diabetic control	Standard Metformin	Test 1 EEBV	Test 2 AEBV	Test 3 EENC	Test 4 AENC
1st	180±4.8	156±9.0	175±5.7	170±3.3	163±3.8	168±3.5	162±2.9
2nd	172±3.3	149±9.0	168±5.2	165±3.8	157±4.3	162±3.9	156±2.9
3rd	174±4.8	148±10	169±6.7	164±4.3	155±4.3	164±4.3	155±4.3
4th	175±4.8	149±9.5	169±7.6	165±5.7	153±5.2	164±5.2	154±4.8
5 th	174±7.2	147±11	170±8.6	159±3.3	152±2.4	159±3.3	154±2.4

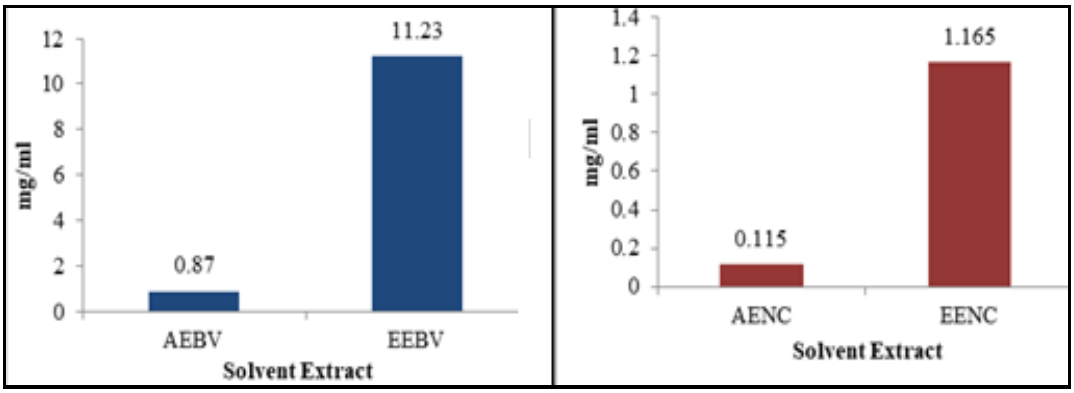

Figure No.1: TPC graph of *Bambusa vulgaris* and *Neolamarckia cadamba* extract

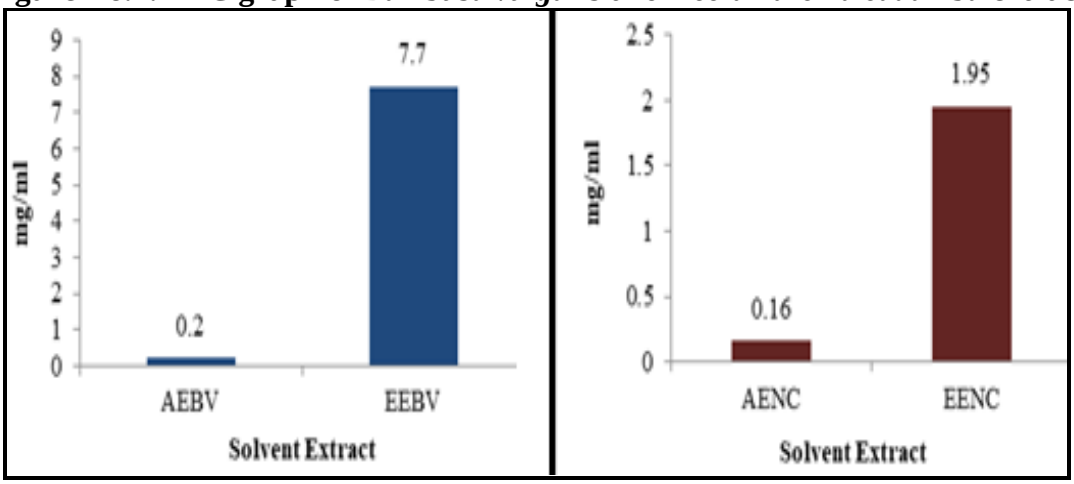

Figure No.2: TFC graph of *Bambusa vulgaris* and *Neolamarckia cadamba* extract

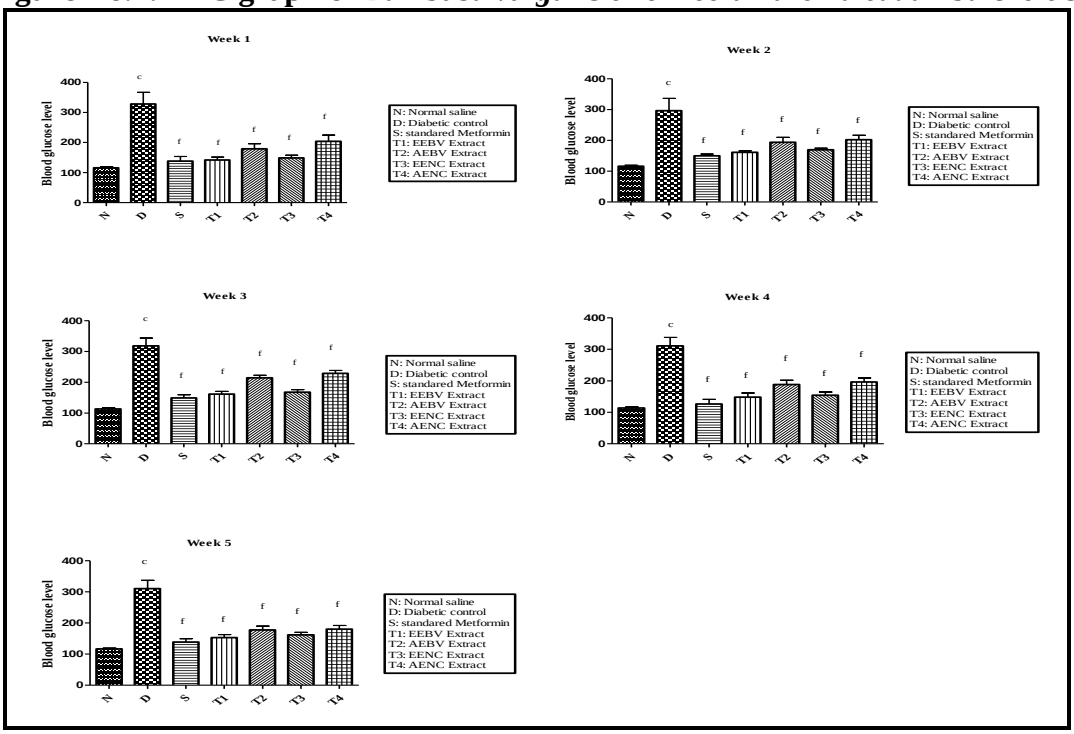

Figure No.3: Values are mean±SEM of 6 rats in each 7 group

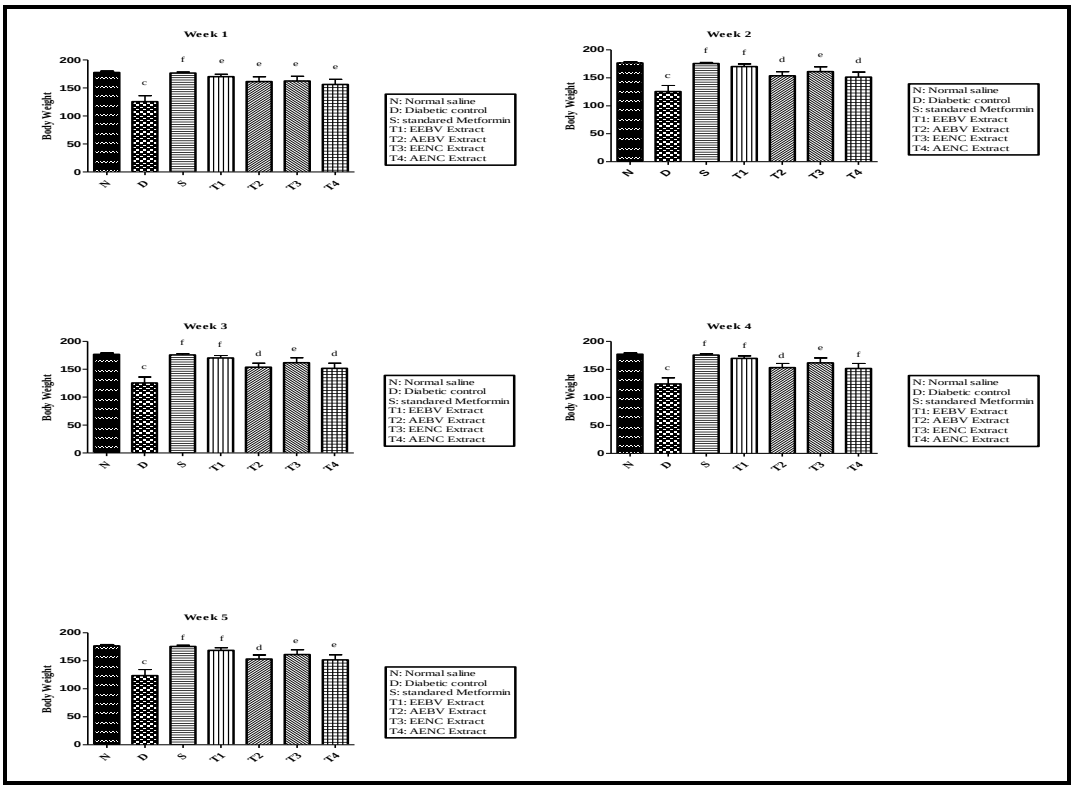

Figure No.4: Values are mean±SEM of 6 rats in each 7 group

CONCLUSION

Our study showed that total phenolic content and total flavonoid content were found higher in EEBV then EENC. All extracts are significantly decrease blood glucose level. May be all extracts decreases insulin level in body and career transport GLUT-4 which are insulin dependent transporter and shows significant antidiabetic activity. The after mentioned research article provided me in information regarding the antidiabetic properties of crude medications, suggesting that they may contain phytoconstituents such as cadambine (Senthilkumar, *et al*)[20] and phytosterols (Munira, *et al* 2020)[21]. Therefore, conducted study on the potential benefits of BV and NC for antidiabetic activity in decreasing blood sugar levels in individuals in Db. To determine the precise mechanism of action of the plant in experimental antidiabetic models, we recommend additional cellular and molecular research. The current study has also created opportunities for more research into the creation of effective phytomedicine for DM derived from NC and BV.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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