Journal of Neonatal Surgery
ISSN(Online):2226-0439
Vol. 14, Issue 22s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Effects Of Acalypha Hispida: Restorative Perspectives of Stz-Induced Diabetic Peripheral Neuropathy in Sprague-Dawley Rats

A. V. Shrirao[1*], N. Y. Bhiwgade[2], D. S. Mohale3, N. I. Kochar[4], Dr. A. V. Chandewar[5]

[1]Associate Professor, Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
[2]Research Scholar, Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
[3]Associate Professor, Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
[4]Professor, Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
[5]Principal, P. Wadhwani College of Pharmacy, Yavatmal, MS., India

[*]**Corresponding Author:**
A. V. Shrirao
Associate Professor, Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
Email ID: abhishrirao@gmail.com

Cite this paper as: A. V. Shrirao, N. Y. Bhiwgade, D. S. Mohale, N. I. Kochar, Dr. A. V. Chandewar, (2025), Effects Of Acalypha Hispida: Restorative Perspectives of Stz-Induced Diabetic Peripheral Neuropathy in Sprague-Dawley Rats,.*Journal of Neonatal Surgery*, 14 (22s), 107-117

ABSTRACT
Oxidative stress has a key role in the pathogenesis and progress of diabetic peripheral neuropathy (DPN), one of the most common and debilitating complications of diabetes mellitus. *Acalypha hispida* is a treasure of multiple pharmacological properties and presently leaves of this plant have been explored to evaluate the protective effects against Streptozotocin-induced diabetic neuropathy in rats. Male Sprague-Dawley rats were injected with Streptozotocin (STZ) (60 mg/kg i.p.) to induce diabetes. Post 21 days of STZ induction, animals were treated with ethanolic extract of *Acalypha hispida* (200 mg/kg, and 400 mg/kg of EEAH) for forty two consecutive days. Followed this, all animals were evaluated for the levels of blood glucose, cholesterol (CH), lipid peroxidation (LPO), Catalase (CAT), Superoxide Dismutase (SOD). Neuropathic pain markers like hyperalgesia, allodynia and motor deficits were assessed before and after the treatment with STZ and EEAH. STZ treated rats exhibited elevated levels of blood glucose, CH, LPO, CAT, SOD in comparison to control rats. EEAH treatment significantly decreased blood glucose levels, CH, LPO, CAT, SOD levels, and restored pro-oxidants status. Further, decrease in hyperalgesia and restorative changes following EEAH treatment suggested the neuroprotective potential of *Acalypha hispida* leaves in diabetic rats. Current study reveals that EEAH exert protective and curative effects against STZ-induced diabetic neuropathy in rats which might be due to its antioxidant, anti-inflammatory, and antiapoptotic properties.

Keywords: *Acalypha hispida*, oxidative stress, diabetic neuropathy, lipid profile

1. INTRODUCTION

Diabetes mellitus is a major global health concern, characterized by metabolic disorders due to defects in insulin secretion or function. [1] Dysregulation of insulin secretion and clearance leads to various metabolic disturbances. Hyperglycemia plays a pivotal role in the development and progression of diabetic neuropathy, as well as other microvascular complications associated with diabetes. Approximately 20% of individuals with diabetes develop diabetic neuropathy and related complications. [2]

Peripheral neuropathy is one of the most common long-term complications of diabetes mellitus, affecting all peripheral nerves, including pain fibers. Several mechanisms contribute to the development of diabetic neuropathy, including metabolic disorders, microvascular damage, neurotrophic support deficits, alterations in neuro-immune interactions, apoptosis of neural and glial cells, and inflammation. [3]

Increased oxidative stress resulting from hyperglycemia is primarily caused by auto-oxidative glycosylation, the formation of advanced glycation end-products (AGEs), and heightened activity of the polyol pathway. Given these mechanisms, antioxidant supplementation has been suggested as a potential protective strategy against these complications, primarily through the scavenging of free radicals.[4] In recent decades, a growing number of natural phenolic compounds with free radical-scavenging properties have been identified, showing promise in mitigating oxidative stress.[5]

The leaves of *Acalypha hispida* are a rich source of bioactive molecules, which have been traditionally used in Indian folk medicine for the treatment of various ailments, including infections, inflammations, and diabetes. Flavonoids, phenolic acids, and naphthoquinones are considered the major phenolic compounds in *Acalypha hispida* leaves. [6] Recent experimental studies have explored the hypoglycemic effects of *Acalypha hispida* leaves extract in diabetes mellitus. These studies have demonstrated that administration of *Acalypha hispida* leaves extract significantly reduced fasting blood sugar (FBS) levels and hemoglobin A1c (HbA1c) compared to control groups. [7] In the present study, we aimed to investigate the beneficial effects and underlying molecular mechanisms of *Acalypha hispida* leaves extract in diabetic neuropathy, a common and serious complication of diabetes.

2. MATERIALS AND METHOD

- **Procurement & Authentication of *Acalypha hispida***

Acalypha hispida plant was collected from Local Area of Shirpur, District- Nashik, Maharastra (India). The plant material was identified and authenticated by Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Vasantrao Naik College of Agriculture Biotechnology, Yavatmal. The authentication reference number is VNCABT/Ytl/Hort/1245/2022, dated 09/03/2022.

- **Extraction of *Acalypha hispida***

The dried leaves of *Acalypha hispida* were coarsely powdered using a mechanical grinder. A weighed quantity of 500 grams of the powder was subjected to continuous hot extraction in a Soxhlet apparatus using ethanol, and the residue marc was collected. [8] The extract was then concentrated and dried at a controlled temperature of 60°C on a water bath. The percentage yield obtained was 8.7%. The dried extract of the leaves was subsequently used for further investigations.

- **Experimental Animals**

Healthy Sprague Dawley rats (8 weeks of age), weighing between 150-250 grams, were selected for the study.[9] The animals were housed in polypropylene cages with wire mesh and husk bedding, and were maintained under standard environmental conditions. The study protocol was approved by the Institutional Animal Ethical Committee (IAEC) with reference number 650/Po/Re/S/2002/CPCSEA/2022/02, dated 16/03/2022.

- **Induction of diabetes in rats by Streptozotocin**

Diabetes was induced in rats by a single intraperitoneal (i.p.) injection of Streptozotocin (STZ) at a dose of 60 mg/kg. A single dose of STZ induced hyperglycemia in the rats within 72 hours. To prevent sudden hypoglycemia, a 5% glucose solution was administered for 24 hours following the STZ injection. [9]

- **Experimental Design**

For this study, rats were divided into five groups, with each group consisting of six animals: [10]

- **Group I: Normal Control Rats (Positive Control)**
  Rats were treated with the vehicle alone for 42 days.
- **Group II: STZ-induced Diabetic Control Rats (Negative Control)**
  Rats were treated with a single i.p. injection of STZ (60 mg/kg).
- **Group III: STZ + EEAH (200 mg/kg)**
  Diabetic rats were treated with EEAH (200 mg/kg) daily via the oral route for 14 days.
- **Group IV: STZ + EEAH (400 mg/kg)**
  Diabetic rats were treated with EEAH (400 mg/kg) daily via the oral route for 14 days.
- **Group V: STZ + Glibenclamide**
  Diabetic rats were treated with glibenclamide (5 mg/kg) daily via the oral route for 14 days.

- **Biochemical Studies**

Blood samples were collected from the retro-orbital plexus under mild anesthesia on day 3, 28, and 42. The collected blood samples were then centrifuged in a cooling centrifuge at 2500 rpm for 10 minutes. The serum was analyzed for blood glucose levels and lipid parameter, including cholesterol (CH). [11]

At the end of the treatment period, the animals were sacrificed, and their livers were isolated. The liver tissues were extracted for the estimation of oxidative stress biomarkers, including lipid peroxidation (LPO), catalase (CAT), and superoxide dismutase (SOD). [12]

Motor Deficit Study Motor function was assessed in rats using two different apparatuses: the Tail Flick Apparatus and the Rota Rod Apparatus. [13]

Tail Flick Apparatus: This method was used to evaluate pain perception and hyperalgesia in the rats.

Rota Rod Apparatus: After one week of training on the Rota Rod Apparatus, the effect of EEAH was assessed. Rats with impaired coordination were unable to maintain balance and fell off the rotating rod.

- **Statistical Analysis of Data**

The results were expressed as mean ± standard deviation (SD). For statistical analysis, the means of the groups were compared using one-way ANOVA, followed by Dunnett's test. A p-value of < 0.01 was considered statistically significant.

3. RESULTS AND DISCUSSION

- **Effect of EEAH on serum Blood Glucose level**

Table No. 1: Estimation of Blood Glucose Level on day3, 28, and 42 in Rats

Group	Glucose Level on 03rd day(mg/dl)	Glucose Level on 28th day(mg/dl)	Glucose Level on 42nd day(mg/dl)
Control	90.33 ±6.26	89.00 ± 5.55	90.33 ± 5.36
Negative control	294.83±7.27**	384.00 ±6.34**	384.33 ±6.53**
EEAH (200mg/kg)	296.83±9.91^{ns}	214.00±7.81$^{@@}$	216.11±9.9$^{@}$
EEAH (400mg/kg)	291.50±8.27^{ns}	213.66±8.11$^{@@}$	203.66±7.11$^{@}$
Glibenclamide	292.66±8.35^{ns}	177.16±6.34$^{@@}$	139.33 ±6.11$^{@@}$

The result were expressed as Mean ± SD (n = 6),

^{ns}= *not significant, *p>0.05, **p<0.01, ***p<0.0001* when compared to positive control groups of rats

^{ns}= *not significant,* $^{@}$*p>0.05,* $^{@@}$*p<0.01,* $^{@@@}$*p<0.0001* when compared to negative control groups of rats

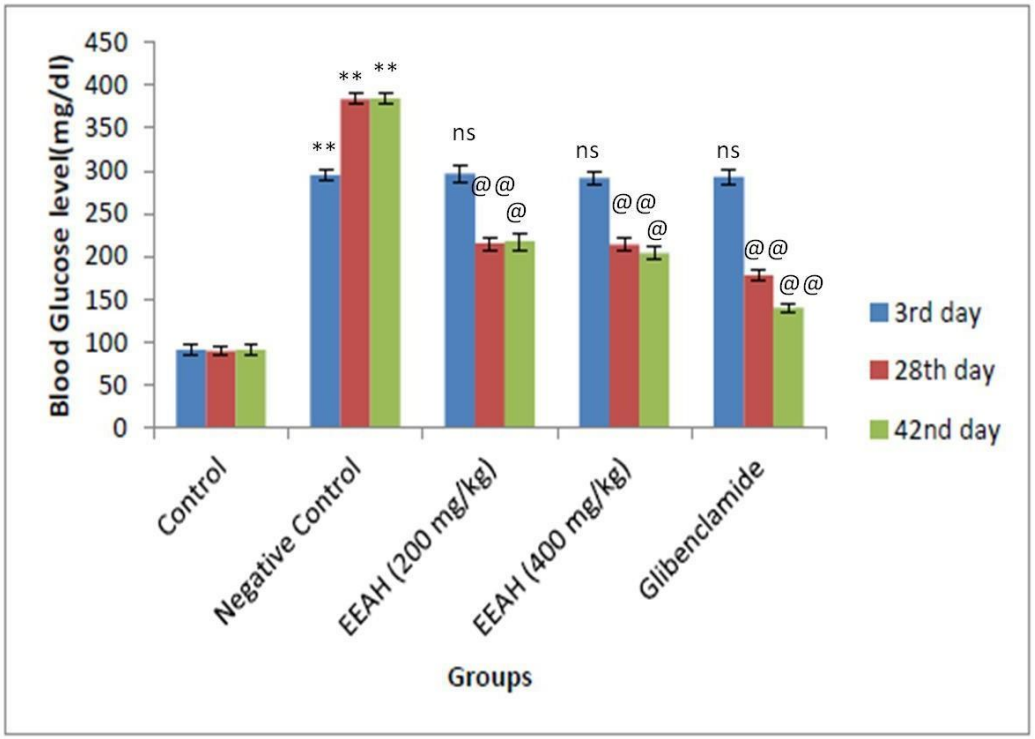

Figure No. 1: Estimation of Blood Glucose Level on day 3,28,and 42 in Rats

Table 1 and Figure 1 depict the effect of Streptozotocin (STZ) on blood glucose levels in rats, measured on days 3, 28, and 42. A significant increase ($p < 0.01$) in blood glucose levels was observed in all STZ-treated groups compared to the control group on days 3 and 28, confirming the successful induction of diabetes. Following the confirmation of diabetic neuropathy on day 28, rats were treated with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment analysis revealed a significant reduction ($p < 0.01$) in blood glucose levels in the EEAH-treated groups (200 mg/kg and 400 mg/kg), as well as in the Glibenclamide-treated group, compared to the negative control. These results suggest that EEAH possesses antihyperglycemic properties, contributing to its potential role in managing diabetic complications.

- **Effect of EEAH on Serum Cholesterol level**

Table No. 2: Estimation of Serum Cholesterol Level on day 3, 28, and 42 in Rats

Group	**Blood Cholesterol Level on 03rd day(mg/dl)**	**Blood Cholesterol Level on 28th day(mg/dl)**	**Blood Cholesterol Level on 42nd day(mg/dl)**
Control	54.47±0.84	24.80±0.79	18.68±0.22
Negative control	97.51±1.03**	15.54±0.84**	28.30±0.31*
EEAH (200mg/kg)	77.23±1.2@	14.24±o.37@	24.18±0.22@@
EEAH (400mg/kg)	66.20±1.23@@	19.53±0.39@@	22.36±0.31@
Glibenclamide	56.21±1.07@@	19.20±0.53@@	21.84.±0.24@@

The result were expressed as Mean ± SD (n = 6),

ns= *not significant,* *p>0.05, **p<0.01, ***p<0.0001 when compared to positive control groups of rats

ns= *not significant,* @p>0.05, @@p<0.01, @@@p<0.0001 when compared to negative control groups of rats

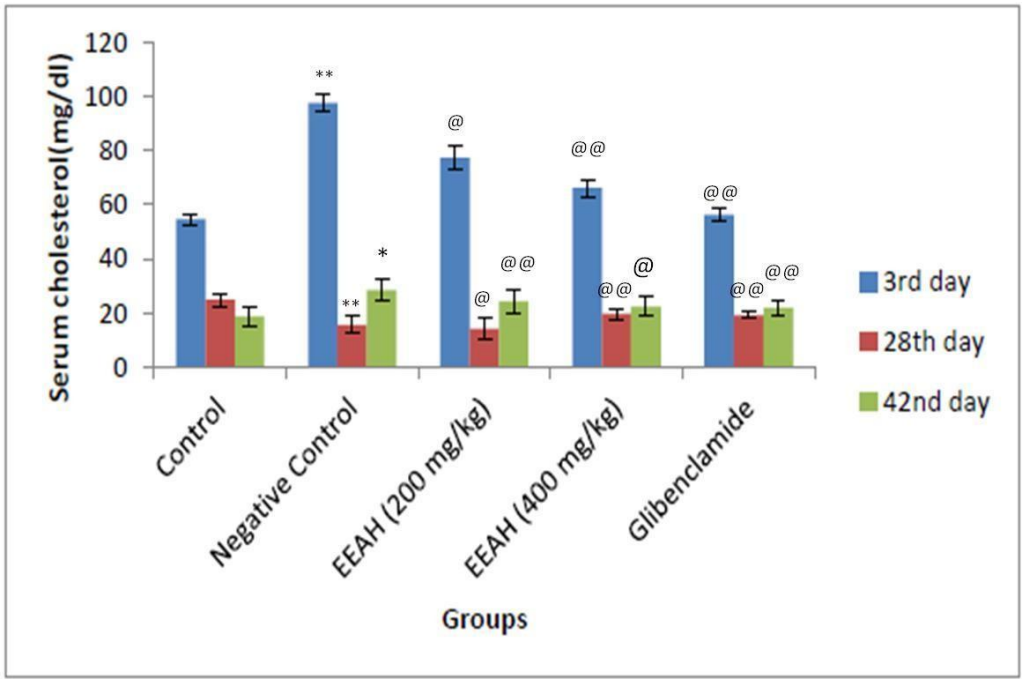

Figure No. 2: Estimation of Serum Cholesterol Level on day 3, 28, and 42 in Rats

Table 2 and Figure 2 illustrate the effect of Streptozotocin (STZ) on serum cholesterol levels in rats, measured on days 3, 28, and 42. A significant increase ($p < 0.01$) in serum cholesterol levels was observed in all STZ-treated groups compared to the control group on days 3 and 28, indicating the development of metabolic disturbances associated with diabetic neuropathy. Following confirmation of diabetic neuropathy, rats were treated with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment analysis revealed a significant reduction ($p < 0.01$) in serum cholesterol levels in the groups treated with EEAH (200 mg/kg and 400 mg/kg), as well as in the Glibenclamide-treated group, compared to the negative control. These findings suggest that EEAH may exert a lipid-lowering effect, contributing to its overall therapeutic potential in diabetes-associated complications.

- **Effect of EEAH on Catalase Activity**

Table No. 3: Estimation of Catalase activity on day 42 in Rats

Groups	Concentration (units/mg of protein)
Control	183.2±3.9
Negative control	118.5±4.7*
EEAH (200mg/kg)	158.3±4.2@
EEAH (400mg/kg)	168.5±5.2@
Glibenclamide	159.3±3.7@

The result were expressed as Mean SD (n=6),

^{ns}= *not significant,* $*p>0.05, **p<0.01, ***p<0.0001$ when compared to positive control groups of rats

^{ns}= *not significant,* $^{@}p>0.05, ^{@@}p<0.01, ^{@@@}p<0.0001$ when compared to negative control groups of rats

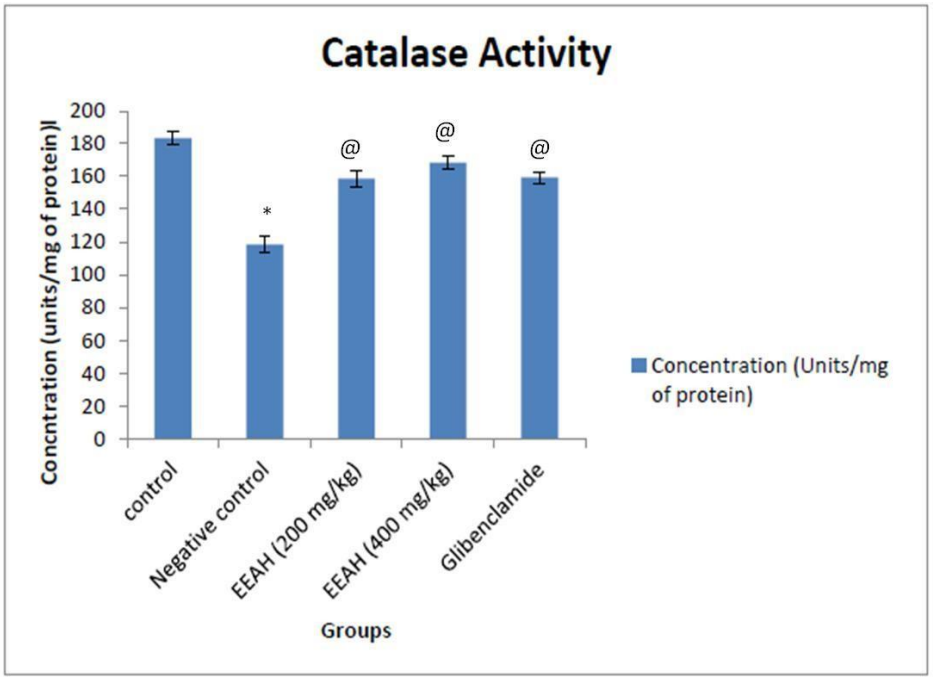

Figure No. 3: Estimation of Catalase activity on day 42 in Rats

Table 3 and Figure 3 illustrate the effect of Streptozotocin (STZ) on catalase activity in rats, assessed on day 42. STZ-treated rats exhibited a significant reduction in catalase activity, indicating compromised antioxidant defense and elevated oxidative stress associated with diabetic neuropathy. Following the confirmation of neuropathy, rats were treated with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment results showed a significant increase ($p < 0.01$) in catalase activity in the groups treated with EEAH (200 mg/kg and 400 mg/kg), as well as in the Glibenclamide-treated group, when compared to the negative control. These findings suggest that EEAH may restore antioxidant enzyme function, supporting its potential neuroprotective and therapeutic role in diabetic neuropathy.

- **Effect of EEAH on Superoxide Dismutase Activity**

Table No. 4: Estimation of Superoxide Dismutase activity on day 42 in Rats

Groups	Concentration (units/mg of Protein)
Control	171.7±7.30
Negative Control	114.7±6.3*
EEAH (200 mg/kg)	152.6±9.7@
EEAH (400 mg/kg)	162.7±11.1@
Glibenclamide	157.67±4.46@

The result were expressed as Mean SD (n=6),

^{ns}= *not significant*, $*p>0.05$, $**p<0.01$, $***p<0.0001$ when compared to positive control groups of rats

^{ns}= *not significant*, $^{@}p>0.05$, $^{@@}p<0.01$, $^{@@@}p<0.0001$ when compared to negative control groups of rats

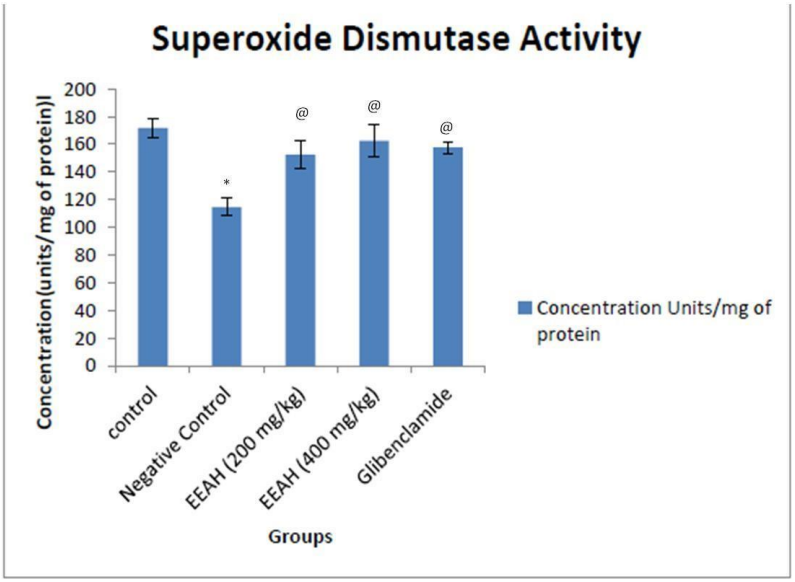

Figure No. 4: Estimation of Superoxide Dismutase activity on day 42 in Rats

Table 4 and Figure 4 show the effect of Streptozotocin (STZ) on superoxide dismutase (SOD) activity in rats, measured on day 42. A reduction in SOD activity in STZ-treated rats indicated impaired antioxidant defense and the presence of oxidative stress associated with diabetic neuropathy. Following confirmation of neuropathy, rats were treated with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment analysis demonstrated a significant improvement ($p < 0.01$) in SOD activity in the groups treated with EEAH (200 mg/kg and 400 mg/kg), as well as in the Glibenclamide-treated group, compared to the negative control. These results suggest that EEAH enhances antioxidant defense mechanisms, potentially contributing to its neuroprotective effects.

- **Effect of EEAH on Lipid Peroxidation Activity**

Table No.5: Estimation of Lipid Peroxidationactivity on day 42 in Rats

Groups	LPO
Control	32.78±4.77
Negative Control	80.22±8.30***
EEAH (200 mg/kg)	52.32±5.52@
EEAH (400 mg/kg)	53.36±7.44@
Glibenclamide	63.83±4.87@

The result were expressed as Mean SD (n=6).

^{ns}= *not significant*, *$p>0.05$, **$p<0.01$, ***$p<0.0001$ when compared to positive control groups of rats

^{ns}= *not significant*, $^{@}p>0.05$, $^{@@}p<0.01$, $^{@@@}p<0.0001$ when compared to negative control groups of rats

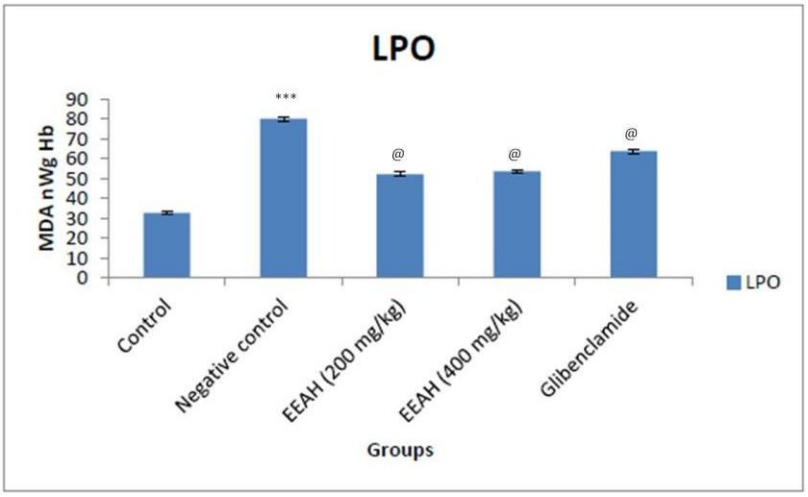

Figure No. 5: Estimation of Lipid Peroxidationactivity on day 42 in Rats

Table 5 and Figure 5 illustrate the effect of Streptozotocin (STZ) on lipid peroxidation activity in rats, measured on day 42. Elevated lipid peroxidation levels in STZ-treated rats confirmed the presence of oxidative stress associated with diabetic neuropathy. Following confirmation of neuropathy, rats received treatment with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment analysis revealed a significant reduction ($p < 0.01$) in lipid peroxidation levels in the EEAH-treated groups (200 mg/kg and 400 mg/kg), as well as in the Glibenclamide-treated group, compared to the negative control. These findings suggest the antioxidant potential of EEAH in mitigating oxidative damage linked to diabetic neuropathy.

- **Effect of EEAH on Tail Flick Response**

Table No. 6: Estimation of Tail Flick Response on day3, 28 and 42 in Rats

Group	Tail Flick Response on 3rd day (sec)	Tail Flick Response on 28th day (sec)	Tail Flick Response on 42nd day (sec)
Control	5.56±0.52	5.84±0.36	5.67±0.30
Negative control	5.30 ± 0.40^{ns}	3.17±0.36**	3.11±0.32**
EEAH (200mg/kg)	3.57 ± 0.34^{ns}	$2.32\pm0.32^{@@}$	$2.29\pm0.27^{@}$
EEAH (400mg/kg)	3.67 ± 0.67^{ns}	$2.42\pm0.36^{@@}$	$2.32\pm0.44^{@}$
Glibenclamide	4.70 ± 0.12^{ns}	$4.34\pm0.34^{@}$	$4.19.32\pm0.35^{@}$

The result were expressed as Mean ± SD (n=6),

^{ns}= *not significant*, $*p>0.05$, $**p<0.01$, $***p<0.0001$ when compared to positive control groups of rats

^{ns}= *not significant*, $^{@}p>0.05$, $^{@@}p<0.01$, $^{@@@}p<0.0001$ when compared to negative control groups of rats

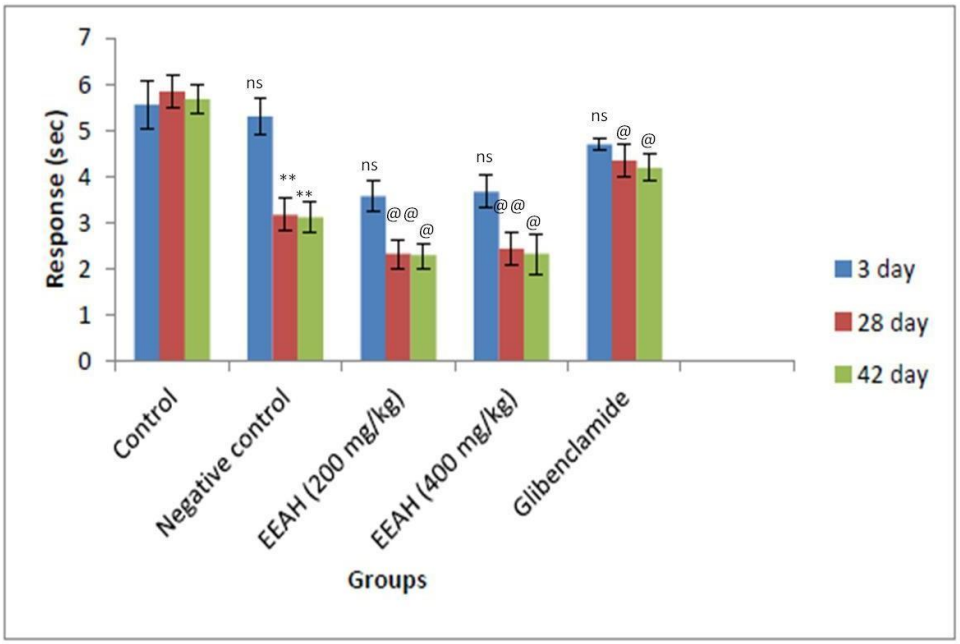

Figure No. 6: Estimation of Tail Flick Response on day3, 28 and 42 in Rats

Table 6 and Figure 6 depict the effect of Streptozotocin (STZ) on tail flick latency, used to assess pain sensitivity in rats on days 3, 28, and 42. A significant decrease ($p < 0.01$) in tail flick latency was observed in STZ-treated rats compared to the control group, indicating the development of hyperalgesia, a hallmark of diabetic neuropathy. Following confirmation of neuropathy, rats were treated with ethanolic extract of *Acalypha hispida* (EEAH) for two weeks. Post-treatment, a significant improvement ($p < 0.01$) in tail flick response was noted in the groups receiving EEAH at 200 mg/kg and 400 mg/kg, as well as in the Glibenclamide-treated group, compared to the negative control. These results suggest that EEAH may alleviate neuropathic pain by improving nociceptive thresholds.

- **Effect of EEAH on Muscle Coordination Response**

Table No.7: Estimation of Muscle coordination Response on day 3, 28, and 42 in Rats

Groups	On 3rd day mean Falling Time (sec)MFT	On 28th day mean Falling Time (sec)MFT	On 42nd day mean Falling Time (sec)MFT
Control	81.42±6.40	84.56±5.40	82.89±4.63
Negative Control	50.64±3.21 ^{ns}	42.89±3.69 **	36.65±2.98 **
EEAH (200 mg/kg)	69.98±3.01 ^{ns}	42.45±3.4 $^{@@}$	64.16±3.24 $^{@}$
EEAH (400 mg/kg)	67.80±2.90 ^{ns}	45.56±2.43 $^{@@}$	61.63±3.45 $^{@@}$
Glibenclamide	70.56±4.6 ^{ns}	69.76±3.32 $^{@@}$	71.56±3.12 $^{@@}$

The result were expressed as Mean SD (n=6),

^{ns}= *not significant,* $^{*}p>0.05, ^{**}p<0.01, ^{***}p<0.0001$ when compared to positive control groups of rats

^{ns}= *not significant,* $^{@}p>0.05, ^{@@}p<0.01, ^{@@@}p<0.0001$ when compared to negative control groups of rats

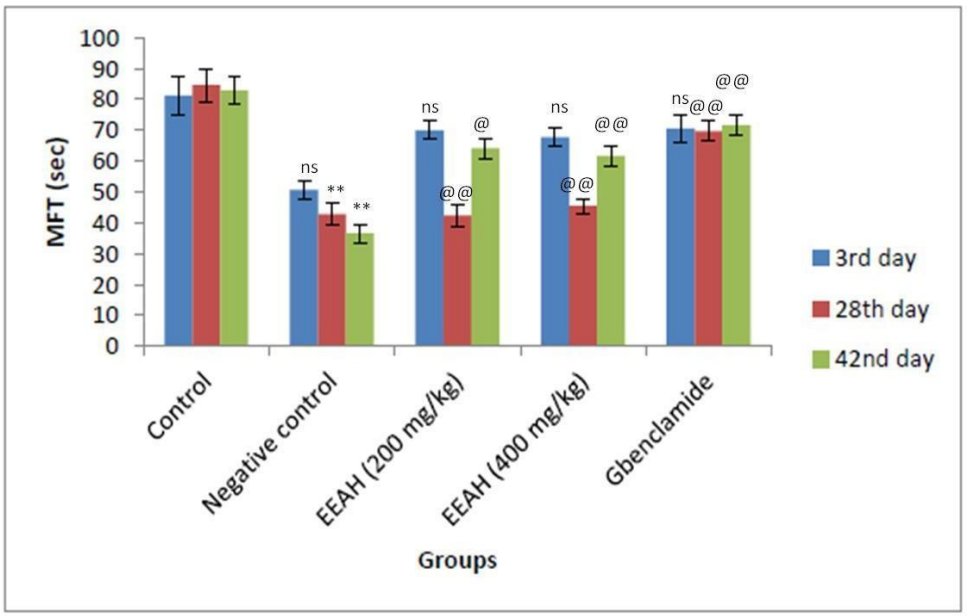

Figure No.7: Estimation of Muscle coordination Response on day 3, 28, and 42 in Rats

Table 7 and Figure 7 illustrate the effects of Streptozotocin (STZ) on muscle strength in rats assessed on days 3, 28, and 42. A significant decrease ($p < 0.01$) in muscle strength was observed in STZ-treated rats compared to the control group, indicating the onset of diabetic neuropathy and associated motor impairment. Following two weeks of treatment with the ethanolic extract of *Acalypha hispida* (EEAH), a marked improvement ($p < 0.01$) in muscle coordination was observed in the groups treated with EEAH at both 200 mg/kg and 400 mg/kg doses, as well as in the Glibenclamide-treated group, compared to the negative control group. These findings suggest the potential of EEAH in improving motor deficits associated with diabetic neuropathy.

4. CONCLUSION

The results of the present study demonstrate that ethanolic extract of *Acalypha hispida* (EEAH) effectively alleviates symptoms associated with diabetic peripheral neuropathy. EEAH significantly reduced serum glucose and improved lipid profile levels in diabetic rats, indicating its potential in mitigating metabolic imbalances commonly linked to diabetes-related complications.[14] Furthermore, EEAH exhibited antioxidant properties by enhancing the activity of endogenous enzymes such as SOD and CAT, while reducing lipid peroxidation (LPO), thus addressing oxidative stress-an underlying factor in diabetic complications. [15] Behavioral assessments also showed improvement in hyperalgesia and motor coordination, suggesting a protective effect on nerve function.[16] Overall, these findings support the therapeutic potential of *Acalypha hispida* leaves extract in managing diabetic neuropathic pain, likely through its antioxidant and neuroprotective mechanisms.

REFERENCES

[1] Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res ClinPract. 2019; 157:107843.

[2] Guariguata L, Whiting D, Weil C, Unwin N. The International Diabetes Federation diabetes atlas methodology for estimating global and national prevalence of diabetes in adults. Diabetes Res ClinPract. 2011; 94(3):322 – 32.

[3] Ogurtsova K, da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, et al. IDF Diabetes Atlas: Global estimates for the prevalence of diabetes for 2015 and 2040. Diabetes Res ClinPract .2017; 128:40–50.

[4] Qu GB, Wang LL, Tang X, Wu W, Sun YH. The association between vitamin D level and diabetic peripheral neuropathy in type 2 diabetes mellitus: An updated systematic review and meta-analysis. J ClinTranslEndocrinol. 2017; 9:25-31.

[5] Hashemi MM, Mousavi E, Arab-Bafrani Z, Nezhadebrahimi A, Marjani A. The most effective polymorphisms of paraoxonase-1 gene on enzyme activity and concentration of paraoxonase-1 protein in type 2 diabetes mellitus patients and non-diabetic individuals: A systematic review and meta-analysis. Diabetes Res ClinPract. 2019; 152:135–45.

[6] Okorondu S, Sokari T, Okorondu M, Chinakwe E. Phytochemical and antibacterial properties of *Acalypha hispida* leaves. Int J Nat Appl Sci. 2010; 5(2):34–43.

[7] H. Alfarisi, S. Sa'diahAnd T. Wresdiyati. Polyphenol Profile, Antioxidant and Hypoglycemic Activity of *Acalypha hispida* Leaf Extract. Indian J Pharm Sci 2020;82(2):291-299.

[8] Rajsekhar Saha and Azhar Ahmed. Hypoglycemic Effect Of *Acalypha Indica* Linn. Plant Extracts On Streptozotocin Induced Diabetes In Rat.International Journal Of Pharmaceutical Sciences And Research. 2011; Vol. 2(11): 2934-2937.

[9] Nucci-Martins C, Martins DF, Nascimento LF, Venzke D, Oliveira AS, Frederico MJ, Silva FR, Brighente IM, Pizzolatti MG, Santos AR.Ameliorative potential of standardized fruit extract of *Pterodon pubescens* Benth on neuropathic pain in mice: Evidence for the mechanisms of action. J Ethnopharmacol. 2015, 4;175:273-86.

[10] Shaikh AS, Somani RS. Animal models and biomarkers of neuropathy in diabetic rodents. Indian J Pharmacol. 2010;42(3):129-134.

[11] Kumar N. R, Srikrishna P, Rani S, Swathi, Rani A. R. Evaluation of Antioxidant and Antidiabetic Potential of *Acalypha indica* leaf extract: Identification of Bioactive Factors. Biosc.Biotech.Res.Comm. 2023;16(3).

[12] Ernie H. Purwaningsih, Nurhadi Ibrahim, Hamdani Zain. ArjoTedjo, Neuroprotection and neuro-therapy effects of *Acalypha indica* Linn. Water extract ex vivo on musclus gastrocnemius Frog, Makara, Kesehatan. 2008, 12(2): 70-75.

[13] Seyed Reza Fatemi Tabatabaei, Shahab Ghaderi, Mohammad Bahrami-Tapehebur, Yaghoob Farbood, Masome Rashno. Corrigendum to "Aloe vera gel improves behavioral deficits and oxidative status in streptozotocin-induced diabetic rats" .Biomed. Pharmacother. 2017,96: 279–290.

[14] Brownlee M. Biochemistry and molecular cell biology of diabetic complications. Nature. 2001; 414(6865):813 – 20.

[15] Dal S, Sigrist S. The protective effect of antioxidants consumption on diabetes and vascular complications. Diseases 2016;4(3):24.

[16] Amin B, Hosseinzadeh H. Evaluation of aqueous and ethanolic extracts of saffron *Crocus sativus* L. and its constituents, safranal and crocin in allodynia and hyperalgesia induced by chronic constriction injury model of neuropathic pain in rats. Fitoterapia. 2012; 83:888–895.

Address for Correspondence
Abhijit V. Shrirao,
Department of Pharmacology. P. Wadhwani College of Pharmacy, Yavatmal, MS., India
E mail:abhishrirao@gmail.com
Submitted on: 13-01-2025
Revised on: 05-04-2025
Accepted on: 07-05-2025

Conflicts of Interest: None

Source of Support: Nil.