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Evaluation of Anticonvulsant and Anti-oxidant Potentials of *Basella Alba* by Influencing the Brain Enzyme Levels in Laboratory Animals

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ABSTRACT

Epilepsy and convulsions constitute a significant class of symptoms that are commonly seen in many neurological diseases. It is understood that there is an apparent alteration in the levels of the enzymes which present brain during epilepsy. Anti-oxidant drugs are known to elevate the protective enzyme levels in the body and restore them to ensure the proper functioning is done. But when the enzyme levels are not managed properly, they can cause further damage and deterioration of the tissue. *Basella alba* is one of such drugs, which is rich in anti-oxidant chemical constituents. Many researchers concluded that many components like vitamin A, C and flavonoids, polyphenols are being reported. In the study, *Basella alba* was investigated for effect on an anti-oxidant enzyme in the brain. The extracts showed a better activity and prevented the brain tissue damage from any oxidative free radical generation. The enzyme levels were healthy at the dose of 400mg/kg of extract.

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INTRODUCTION

Epilepsy and convulsions are the primary class of symptoms that are commonly seen in many neurological diseases. There are many types of epilepsies like general, clonic tonic, grand mal, petit mal etc. this may be considered as a disorder or a symptom of other diseases. Generally, epilepsy causes an increase in the free radicals in the brain and thus damage the brain tissue and nerves. It is also clear that the generated free radicals also cause an increase in seizures (Choi, 1993). There are also reports and investigations that the oxidative reactions are primary aetiology for epilepsy. It is seen there is an apparent alteration in the levels of the enzymes in the brain during epilepsy.

With an understanding, the anti-oxidants combat the generated free radicals effectively, and we can assume that the anti-oxidants can have a positive effect on epilepsy too. Apart from causing brain damage or nerve damage, these free radicals adversely affect other tissues and cause damage to body functions. Due to the generation of free radicals, the protective enzymes like superoxide dismutase, catalase, glutathione peroxidase, glutathione reductase and glutathione transferase levels are significantly reduced. These anti-oxidant drugs are known to elevate the protective enzyme levels in the body and restore them to ensure the proper functioning is done. But when the enzyme levels are not managed properly, they can cause further damage and deterioration of the tissue.

Basella alba is one of such drugs, which is rich in anti-oxidant chemical constituents. There had been researches that were conducted on the herb, and many components like vitamin A, C and flavonoids, polyphenols are being reported (Dogra *et al.*, 1977). The leaf extracts of the plants were being evaluated for the anti-oxidant activity and said the same. So, with an assertion that the anti-oxidant activity of plants will reduce the generated free radicals and epilepsy causes elevated free radicals, the plant leaf extracts are being tested for the enzyme level restoration that works for epilepsy also. So, this research focuses on restoration of the elevated enzyme levels that are elevated due to induction of epilepsy.

METHODOLOGY

The plant leaves of *Basella alba* were collected from a local area near Sullurpet in January and duly authenticated. The plant parts were shade dried and finely powdered. 45g of this powder was extracted with Methanol using Soxhlet and is evaporated until the consistency is fine to paste (BAM) and is stored in an airtight container for further use. Animals selected for the study are albino Wistar rats which weight approximately 145-175g and well maintained in the well-ventilated cabin and are kept in their cages. They are allowed free of access for food and water. The animals were divided into 5groups having 6rats in each group. The first group received normal saline as a control, without induction of seizures, all the groups received the seizure induction, and 14 days before induction, 3^{rd}, 4^{th} and 5^{th} group were tested with extracts at different doses 100, 200 and 400mg/kg body weight.

EIC method

This method uses electricity for the induction of seizures. Rats received electrical shock using electroconvulsiometer. The induction of epilepsy was observed, and the animals were sacrificed, and brain tissue was isolated and stored to calculate further parameters (Rola *et al.*, 2002).

PTZ method

In this method, Pentylene tetrazole was used to induce convulsion at a dose of 90mg/kg in the subcutaneous route. These animals were observed to induce seizures for 30min after PTZ administration. The induction of epilepsy was found, and the animals were sacrificed, and brain tissue was isolated and stored to calculate further parameters.

Anti-oxidant enzymes

The brain tissue collected was weighed and homogenated. 100mg of this homogenate was missed with 10ml of Tris-HCl buffer at 4^0c. The mixture was centrifuged, and the supernatant liquid was isolated to test for anti-oxidant enzymes like Catalases, GP's, GR's, SOD and lipid peroxidases using standard procedures.

The obtained data were subjected to multiple comparisons using Dunnett's p test, and the values were given out as means and their standard errors.

RESULTS AND DISCUSSION

The extracts showed a dose-dependent restoration of brain enzymes. The results were tabulated in table 1 and 2. The catalases present in the brain are around the amount of 22 units/mg in normal rats. And the levels were drastically reduced by induction of seizures in both the methods. The extract showed an elevation in catalases and restoration to the average level.

Superoxide dismutase is an enzyme that protects the brain from oxidation from free radicals from metal ions (Ziyaurrahman and Jayvadan, 2012; Akpinar *et al.*, 2007). The induction of epilepsy, the levels of SOD were lowered significantly and are prevented from dropping with the administration of extracts at different doses.

Glutathione peroxidases were helpful in the reduction of peroxide-free radicals with reaction and reduced the production of reactive oxygen free radicals in the brain. With the induction of epilepsy, their concentration in the brain tissue is lowered. The administration of the extracts in different doses prevented the lowering of glutathione peroxidases and helped avert brain tissue from undergoing oxidative damage (Arumugam *et al.*, 2009).

Lipid peroxidases level in the brain increases with the induction of epilepsy and seizures. The peroxidases, as discussed, will prevent the brain damage by reacting with the H2O2. When there is a rise in lipid peroxidation in the tissue, it means there is a significant lowering of the glutathione peroxidases which means the brain is getting damaged due to free radicals.

This results in the oxidative damage and further, leading to epilepsy and damage to brain tissue (Grant and Heel, 1991; Carmona-Aparicio *et al.*, 2019). The extract administration prevented this from happening as it is assumed that the flavonoids and polyphenols present in the extract were thought to combat the generated free radicals and prevented the lipid peroxidation (Paglia and Valentine, 1967).

Glutathione Reductases helps to maintain the thiol molecules in its reduced state. If it gets oxidized, it reacts with NADPH and causes damage to the

Table 1: Effect of extract on the anti-oxidant brain enzymes in EIC method

Group treatment	Catalase Units/mg	Glutathione Peroxidase Units/mg	Superoxide Dismutase Units/mg	Lipid Peroxidation Nmol/mg	Glutathione Reductase Units/mg
Normal saline	23.18±0.05	25.32±0.98	12.61±0.27	1.12±0.60	26.14±0.70
EIC+saline	18.24±0.29*	17.02±0.51*	6.20±0.85*	4.06±0.15*	5.87±0.91*
EIC+BAM 100mg/kg	19.39±0.03	19.51±0.42	8.01±0.36	2.49±0.59	3.45±0.48
EIC+ BAM 200mg/kg	21.66±0.34^a	22.31±0.43^a	11.83±0.31^a	1.98±0.27^a	2.64±0.92^a
EIC+ BAM 400mg/kg	22.41±0.01^a	24.83±0.68^a	12.01±0.45^a	1.32±0.98^a	2.22±0.73^a

The values were given as means and their errors inmean; P<0.01* significant when compared to the normal group. a-significantwhen compared to EIC+saline group

Table 2: Effect of extract on the anti-oxidant brain enzymes in PTZ method

Group treatment	Catalase Units/mg	Glutathione Peroxidase Units/mg	Superoxide Dismutase Units/mg	Lipid Peroxidation Nmol/mg	Glutathione Reductase Units/mg
Normal saline	22.64±0.07	25.43±0.16	13.32±0.51	1.72±0.34	32.65±0.57
PTZ+saline	14.72±0.02*	16.27±0.09*	8.73±0.68*	5.87±0.91*	21.08±0.42*
PTZ + BAM 100mg/kg	17.94±0.06	18.45±0.69	9.16±0.72	3.45±0.48	24.91±0.63
PTZ + BAM 200mg/kg	18.26±0.11^a	20.59±0.23^a	10.02±0.82^a	2.64±0.92^a	27.19±0.31^a
PTZ + BAM 400mg/kg	20.10±0.04^a	23.28±0.87^a	13.27±0.46^a	2.22±0.73^a	29.76±0.82^a

The values were given as means and their errors inmean; P<0.01* significant whencompared to the normal group. a-significant when compared to PTZ+saline group

brain tissue. The glutathione reductase reacts with NADPH and keeps it in its reduced state, thereby preventing the brain from damage (Raygude *et al.*, 2012).

CONCLUSION

In the research, *Basella alba* was investigated for effect on an anti-oxidant enzyme in the brain. The extracts showed a better activity and prevented the brain tissue damage from any oxidative free radical generation. The enzyme levels were normal at aa dose of 400mg/kg of extract.

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Conflict of Interest

Authors declared no conflict of interest.

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