Conclusion

Our findings demonstrated that epilepsy caused significant impact on the central nervous system (CNS) both functionally and behaviourally. The evaluation of these damages at molecular level is very important, especially in the cerebral, hippocampal and cerebellar function. A decrease in the body weight was found in the epileptic group of rats as result of decreased food and water intake. Structural and functional integrity of brain depends on regular glucose and oxygen supply. The receptor binding studies showed alterations in the 5-HT$_{2C}$ and NMDA receptors in the cerebral cortex, hippocampus, cerebellum and brainstem. 5-HT$_{2C}$ receptors were found to be increased in the cerebral cortex and hippocampus while it was decreased in the cerebellum and brainstem of epileptic rats. The NMDA receptors showed a decrease in cerebral cortex and hippocampus while it was significantly increased in brainstem and cerebellum during epilepsy. Real-Time PCR confirmed receptor data of 5-HT$_{2C}$ NMDA2b, mGlu5 and glutamate transporter- GLAST gene expression. The second messenger study confirms that the changes in the receptor levels did percolate through alterations in IP3, cGMP and cAMP levels. These studies suggest that 5-HT$_{2C}$ receptor potentiates Ca$^{2+}$ release through IP3 receptor activation. Also increased NMDA mediated overactivity leading to increased IP3 dependent Ca$^{2+}$ release. Increased Ca$^{2+}$ release triggers release of Cytochrome C thereby initiating the apoptotic process. This causes cell damage during epileptic stress in the rats. The *Bacopa monnieri* and carbamazepine treatment to epileptic rats is able to reverse this damage. The behavioural studies by rotarod test show a decrease in motor activity in the epileptic rats as result of seizural attack. Epileptic rats suffered from axiogeny and depression which is evident from elevated plus maze test, social interaction test and forced swim test. We showed evidence for dysfunction of the epileptic cerebral cortex and hippocampus that is a reflection for manifestation of abnormal behavioural
patterns and possibility for cellular proliferation. The receptor analysis and gene expression studies along with the behavioural data implicate a role for 5-HT$_{2C}$ receptors in the manifestation of anxiety and NMDA receptors for the cognitive and memory deficits associated with epileptic rats. Our findings also suggest dysfunction of the epileptic cerebellum that is a reflection of cerebellar serotonergic and glutamatergic abnormality affecting the motor coordination and timing of action. It is evident that neuroprotective role of *Bacopa monnieri* in epilepsy involves the interaction of 5-HT$_{2C}$ and NMDA receptors, with modulation of mGlu5 and GLAST receptor gene expression at the mRNA level and IP3, cGMP and cAMP activation at the second messenger level. Our experimental results thus support the anticonvulsant property of *Bacopa monnieri* at the molecular level. We conclude from our studies that *Bacopa monnieri* extract treatment potentates a therapeutic effect by reversing the alterations in 5-HT$_{2C}$, NMDA receptors, mGlu5, GLAST and IP3, cGMP and cAMP that occur during epilepsy, resulting in reduced glutamate-mediated excitotoxicity in the brain which has clinical significance in the treatment and management of epilepsy.