Central nervous system disorders or mental disorders or mental illnesses are the psychological or behavioral pattern that occurs in an individual and is thought to cause distress or disability that is not expected as part of normal development or culture.

More than 20% of population suffers from CNS disorders at some time during their life. The WHO predicts CNS disorders will become the leading cause of premature death or disability worldwide by the year 2020. Approximately two-third of the patients respond to the currently available treatments, but the magnitude of improvement is still disappointing. Then, the medical need for newer, better tolerated and more efficacious treatments remains high. At present many therapeutic agents are available to treat disorders, but the major limitations of these drugs are their side effects and high cost of modern treatment; indicates a dire need for the development of new safer drugs and alternative strategies for the prevention and treatment of many diseases and disorders.

Despite several advances in the health care system, numerous new diseases have emerged. Considering the inherent weakness and limitations, allopathy by itself could not tackle the plethora of problem posed by emergence of new diseases. Many newer drugs which have developed recently represent a real progress in the treatment of non-responders and refractory patients. However, the problem of adverse effects has also not been circumvented completely. Hence, search should continue to develop newer, more effective and safer neuroprotective agent for the treatment of various CNS disorders.

In search for new therapeutic products for the treatment of CNS disorders, medicinal plant research, worldwide has progressed constantly, demonstrating the pharmacological effectiveness of different plant species in a variety of animal models. Despite the use of herbal medicines over many centuries, only a relatively small number of plant species has been studied for possible medicinal applications. Safety and efficacy data are available for an even smaller number of plants, their extracts and active ingredients; and preparation containing them. An innovative research effort to define the advantages of traditional systems of
medicine with respect to their safety and efficacy could result in a better utilization of these complementary systems of medicine.

In recent years, there has been a phenomenal rise in the interest of scientific community to explore the pharmacological actions of herbs or to confirm the claims made about them in the official books of Ayurveda. In addition, the search for novel pharmacotherapy from medicinal plants for psychiatric illnesses has progressed significantly in the past decade. An increasing number of herbal products have been introduced into psychiatric practice, as alternative or complementary medicines, and also there are a large number of herbal medicines whose potential has been assessed in a variety of animal models. In fact, these models have contributed to the screening of new psychopharmacological tools and to the understanding of their biological activity. There has been renewed interest in exploring the herbal medicines for the management of number of psychiatric disorders.

Previous studies reported that the plants *Amaranthus spinosus*, *Annona squamosa* and *Brassica nigra* possess wide range of pharmacological activities. *Amaranthus spinosus* possesses digestive, laxative, diuretic, stomachic, antipyretic, to improve appetite, biliousness, blood diseases, burning sensation, leprosy, bronchitis, rat bite, piles, and leucorrhea, while the boiled leaves and root are given to children as a laxative, emollient, and poultice for abscesses, boils, and burns. *Annona squamosa* traditionally used for the treatment of dysentery, cardiac problems, fainting, worm infections, constipation, hemorrhage, dysuria, fever, thirst, malignant tumors, ulcers, diarrhea, dysentery, atonic dyspepsia acaricidal, insecticidal and larvicidal activity, and it has also been used for biosynthesis of palladium and silver nanoparticles. *Brassica nigra* has traditionally used as simple rubefacient, diuretic, emetic, pneumonia, bronchitis, nerve stimulant and vesicant apart from the reported use plant is having application in allied field such as kitchen, phytomedicine, general medication for its medicinal value. The seed extracts of *Brassica nigra* was reported as antidiabetic, antihyperlipidemic, antibacterial, anthelmenthic, antiepileptic activity. The leaves hot with a pleasant taste increase the bile, vermicide, good for throat complaints and seeds are bitter, hot and acrid used to cure enlargement of the spleen and dispel fever, increase the bile, remove cough, tumors, increase appetite, cure skin diseases, itching and destroy external
Conclusion

parasites is mentioned in Ayurveda. Poultice of seed are used counter irritant in several complaints of nervous system, pneumonia and an emetic in narcotic poisoning.

The present study was aimed to establish the potential neuropharmacological properties of *Amaranthus spinosus*, *Annona squamosa* and *Brassica nigra* based on its uses in traditional medicine, as reported earlier. In traditional system of medicine all the plants are claimed as a nerve tonic that releases stress, negativity and tension in heightened activity. In-spite of the reported pharmacological properties of *Amaranthus spinosus*, *Annona squamosa* and *Brassica nigra* in a variety of models, there are less major investigative reports available pertaining to its neuropharmacological effects, which provided a way to study neuropharmacological profile of the plants and explore these plants for nervous system disorders. Therefore, in the present investigation we have carried out neuropharmacological evaluation of methanol extract of *Amaranthus spinosus* and *Annona squamosa* whereas ethanol extract of *Brassica nigra* furthermore ethyl acetate fraction of *Amaranthus spinosus* and acetone fraction of *Brassica nigra*.

Phytochemical tests showed presence of flavonoids, alkaloids, glycosides, tannins, and saponins in methanol extract of *Annona squamosa* and *Brassica nigra* whereas flavonoids, glycosides, tannins, and saponins in *Amaranthus spinosus*. Earlier reports of chemical constituents and their pharmacology suggest that the plants containing flavonoids, saponins, tannins possess activity against many CNS disorders. It is possible that the mechanism of diverse actions of *Amaranthus spinosus*, *Annona squamosa* and *Brassica nigra* could be due to any of these phytochemicals.

Presence of phytoconstituents was ratified with the help of TLC as well as HPLC fingerprinting of test extracts and standardized using spectrophotometric methods. Fingerprinting profile of plant extracts confirmed presence of flavonoids as well as polyphenols. In addition, spectroscopic standardization provides information of quantitative analysis of phytoconstituents content. Spectrophotometric quantitative determination of the particular phytoconstituents for standardization was decided on the basis of preliminary phytochemical analysis of respective extract.
Test extracts were screened for pharmacological profile using both *in vitro* and *in vivo* methods. Antioxidant profile (*in vitro*) was screened in terms of DPPH scavenging (% DPPH scavenging and % RRI of DPPH). The results of the acute and subacute toxicity studies indicated that oral administration of methanol extract of *Amaranthus spinosus*, *Annona squamosa* and ethanol extract of *Brassica nigra* did not induce significant alterations in almost all biochemical, hematological and morphological parameters. Thus the extracts of these plants were found to be safe in acute and subacute toxicities at high dose (2 g/kg) in experimental animals. Chronic toxicity, mutagenicity and carcinogenicity studies are further necessary to support the safe and sound use of these plants.

The effects of extracts were studied on various *in vitro* preparations. The results of the *in vitro* study indicated that plants extracts significantly inhibited dopamine and serotonin induced contractions on rat vas deference and fundus respectively. In addition, plants extracts significantly potentiated acetylcholine induced contractions. Thus, plants extracts has antidopaminergic, antiserotonergic and cholinergic potentiating effect.

From the *in vitro* results, the effect of extracts was studied on various *in vivo* models to establish its neuropharmacological profile. The neuropharmacological effects determined in the present study suggest that *Amaranthus spinosus*, *Annona squamosa* and *Brassica nigra* produces a significant CNS depressant activity.

In the present work, the effect of extracts was studied in several behavioral animal models like elevated plus maze and light/dark paradigm for its anxiolytic property. The plants extracts increased the exploration and the time spent in open arm. The number of entries and time spent in the enclosed arms were reduced indicating an anxiolytic effect.

The anti-depressant effect of plant extracts was evaluated by using forced swim test (FST), tail suspension test (TST). The plant extract significantly increased latency of immobility and decreased duration of immobility indicating an antidepressant like effect.

PTZ induced convulsion is an acute experimental model in a preliminary screening to test potential anticonvulsant drugs. The PTZ-induced seizures are similar to the symptoms observed in the absence seizures and the drugs useful in the treatment of absence seizures; suppress PTZ-induced seizures. The plant
extract delayed occurrence of seizures and reduced mortality indicating its anticonvulsant potential.

In the present study, the effect of extracts on psychosis was assessed by using lithium sulphate-induced head twist. Pretreatment with plant extracts significantly decreased number of head twitches. The results indicated that extracts contains chemical constituents that possess significant antipsychotic activity.

Haloperidol-induced catalepsy is one of the animal models to test the extrapyramidal side effects of antipsychotic drugs. In the present study, plant extracts significantly potentiated haloperidol-induced catalepsy. The potentiation of catalepsy is indicative of the ability of the drug to antagonize dopamine D$_2$ receptor in striatum.

In the present work, the effect of extracts was studied in foot shock-induced aggression. The plants extracts reduced the number of fighting attacks and increased latency to fight, therefore indicating a possible antiaggression activity.

The methanol extract of *Amaranthus spinosus* and ethanol extract of *Brassica nigra* was further fractionated successively by continuous hot extraction method with Petroleum-ether (60-80°C) (PE), Chloroform (CH), Ethyl acetate (EA) and Acetone (AC) using Soxhlet extractor separated as ethyl acetate and acetone fractions.

Phytochemical tests showed presence of flavonoids, alkaloids, tannins and saponins in acetone fraction of *Brassica nigra* whereas flavonoids, tannins, and saponins in ethyl acetate fraction of *Amaranthus spinosus*.

Presence of phytoconstituents was ratified with the help of TLC as well as HPLC fingerprinting of test fractions and standardized using spectrophotometric methods. Fingerprinting profile of fractions confirmed presence of flavonoids as well as polyphenols. In addition, spectroscopic standardization provides information of quantitative analysis of phytoconstituents content. Spectrophotometric quantitative determination of the particular phytoconstituents for standardization was decided on the basis of preliminary phytochemical analysis of respective fractions.
Test fractions were screened for pharmacological profile using both \textit{in vitro} and \textit{in vivo} methods. Antioxidant profile (\textit{in vitro}) was screened in terms of DPPH scavenging (% DPPH scavenging and % RRI of DPPH).

The effects of fractions were studied on various \textit{in vitro} preparations. The results of the \textit{in vitro} study indicated that fractions significantly inhibited dopamine and serotonin induced contractions on rat vas deference and fundus respectively. In addition, fractions significantly potentiated acetylcholine induced contractions. Thus, a fraction has antidopaminergic, antiserotonergic and cholinergic potentiating effect.

From the \textit{in vitro} results, the effect of fractions was studied on various \textit{in vivo} models to establish its neuropharmacological profile. The neuropharmacological effects determined in the present study suggest that \textit{Amaranthus spinosus} ethyl acetate and \textit{Brassica nigra} acetone fractions produces a significant CNS depressant activity.

In the present work, the effect of fractions was studied in several behavioral animal models like elevated plus maze and light/dark paradigm for its anxiolytic property, forced swim test (FST), tail suspension test (TST) for anti-depressant effect, PTZ induced convulsion for its anticonvulsant potential, Haloperidol-induced catalepsy along with lithium sulphate-induced head twitch for its antipsychotic activity and foot shock-induced aggression for antiaggression activity.

The plants \textit{Amaranthus spinosus}, \textit{Annona squamosa} and \textit{Brassica nigra} showed a great neuropharmacological and neuroprotective potential in various experimental models. The activity data generated in this study could help to explore these plants and set a new therapeutic strategy in the treatment of various central nervous system disorders. The results obtained in this study could also help to set a new research goals and strategies in the area of neuropharmacology and plant drug research. Further, it is need to separate and identify individual chemical constituents; and to study its mechanism of action at molecular level.