**INTRODUCTION**

Epilepsy is a major neurological disorder characterized by recurrent seizures with a lifetime prevalence of 5% (Sander and Schorron, 1996; Raza et al., 2001). Common causes include infectious, traumatic, metabolic or tumoural conditions or it may be idiopathic, that is unrelated to any underlying cause other than a possible hereditary predisposition (Engel, 2001). Falciparum malaria however is a common cause of seizures in children living in malaria endemic areas (Ogutu and Newton, 2004). In cases of cerebral malaria over 80% of children are admitted with a history of convulsions (Molyneux et al., 1989). Furthermore, seizures in malaria are associated with a poor outcome. Prolonged seizures in children with malaria are associated with a neurological, cognitive and language deficits and the development of epilepsy (Holding et al., 1999; Carter et al., 2003). It can be postulated therefore, that sub-Saharan Africa may have a higher prevalence of epilepsy being malaria endemic. Patients with epilepsy fail to experience adequate control of their seizures despite optimal use of available antiepileptic drugs-AEDs (Stables and Kuperberg, 1997). Synthetic AEDs are effective only in approximately 50% of patients. Many refractory cases of epilepsy still remain highly resistant to their treatment (Heinemann et al., 1994; Shorvon, 1996). Furthermore, AEDs are associated with side effects, including teratogenicity and adverse effects on cognition and behavior (Samren et al., 1997; Raza et al., 2001).

According to Meldrum (1997), plant extracts can be an important source of natural and safer drugs for the treatment of epilepsy. Extracts, fractions and pure compounds from several medicinal plants have been used in traditional medicine for the treatment of epilepsy and have demonstrated anticonvulsant properties that need to be further investigated (Raza et al., 2001). Acacia albida also known as Faidherbia albida family Mimosoideae is commonly known among Hausa people in Northern Nigeria as *petit mal*. The methanol stem bark extract of *Acacia albida* was studied for its anticonvulsant effects in mice and chicks. The test systems selected were the maximal electroshock test (MEST) in chicks, Pentyleneetraetrate (PTZ) and Strycline (STN) induced seizure tests in mice. The effect of the extract on diazepam induced sleep in mice and preliminary phytochemical screening were also conducted. The extract (50, 100, 200 mg/kg) significantly (*p< 0.001*) shortened onset of sleep compared to normal saline (control) from 4.8±0.2 to 2.2±0.3, 2.0±0.0 and 2.0±0.3, respectively. The methanol stem bark extract of *Acacia albida* also increased total sleeping time from 58.2±14.0 to 201.0±23.9, 111.4±16.1 and 89.6±22.5 at 50, 100 and 200 mg/kg, respectively. The increase was significant (*p< 0.001*) at 50 mg/kg. *Acacia albida* stem bark extract at 200 mg/kg protected 50% of the mice against STN induced seizure with 63.3% survival rate. There was no protection against STN induced seizure at 50 and 100 mg/kg of the extract but a 16.3% and 33.3% protection against mortality was observed respectively. The extract was also able to delay, though insignificantly the onset of seizure at all the doses tested. In the PTZ induced seizure test, the extract did not protect the mice against seizure nor mortality but there was a significant (*p< 0.03*) delay in onset of seizure at 100 and 200 mg/kg. Similarly the extract of *Acacia albida* did not protect chicks against MEST. However there was a non significant dose dependent shortening of recovery time at the doses tested. Preliminary phytochemical studies of the stem bark extract of *Acacia albida* revealed the presence of tannins, saponin triterpenes and steroids. The intraperitoneal LD₅₀ in mice was estimated to be 1131.4 mg/kg. Our results suggest that the methanol stem bark extract of *Acacia albida* was studied for its anticonvulsant effects in mice and chicks. The test systems selected were the maximal electroshock test (MEST) in chicks, Pentyleneetraetrate (PTZ) and Strycline (STN) induced seizure tests in mice. The effect of the extract on diazepam induced sleep in mice and preliminary phytochemical screening were also conducted. The extract (50, 100, 200 mg/kg) significantly (*p< 0.001*) shortened onset of sleep compared to normal saline (control) from 4.8±0.2 to 2.2±0.3, 2.0±0.0 and 2.0±0.3, respectively. The methanol stem bark extract of *Acacia albida* also increased total sleeping time from 58.2±14.0 to 201.0±23.9, 111.4±16.1 and 89.6±22.5 at 50, 100 and 200 mg/kg, respectively. The increase was significant (*p< 0.001*) at 50 mg/kg. *Acacia albida* stem bark extract at 200 mg/kg protected 50% of the mice against STN induced seizure with 63.3% survival rate. There was no protection against STN induced seizure at 50 and 100 mg/kg of the extract but a 16.3% and 33.3% protection against mortality was observed respectively. The extract was also able to delay, though insignificantly the onset of seizure at all the doses tested. In the PTZ induced seizure test, the extract did not protect the mice against seizure nor mortality but there was a significant (*p< 0.03*) delay in onset of seizure at 100 and 200 mg/kg. Similarly the extract of *Acacia albida* did not protect chicks against MEST. However there was a non significant dose dependent shortening of recovery time at the doses tested. Preliminary phytochemical studies of the stem bark extract of *Acacia albida* revealed the presence of tannins, saponin triterpenes and steroids. The intraperitoneal LD₅₀ in mice was estimated to be 1131.4 mg/kg. Our results suggest that the methanol stem bark extract of *Acacia albida* was studied for its anticonvulsant effects in mice and chicks. The test systems selected were the maximal electroshock test (MEST) in chicks, Pentyleneetraetrate (PTZ) and Strycline (STN) induced seizure tests in mice. The effect of the extract on diazepam induced sleep in mice and preliminary phytochemical screening were also conducted. The extract (50, 100, 200 mg/kg) significantly (*p< 0.001*) shortened onset of sleep compared to normal saline (control) from 4.8±0.2 to 2.2±0.3, 2.0±0.0 and 2.0±0.3, respectively. The methanol stem bark extract of *Acacia albida* also increased total sleeping time from 58.2±14.0 to 201.0±23.9, 111.4±16.1 and 89.6±22.5 at 50, 100 and 200 mg/kg, respectively. The increase was significant (*p< 0.001*) at 50 mg/kg. *Acacia albida* stem bark extract at 200 mg/kg protected 50% of the mice against STN induced seizure with 63.3% survival rate. There was no protection against STN induced seizure at 50 and 100 mg/kg of the extract but a 16.3% and 33.3% protection against mortality was observed respectively. The extract was also able to delay, though insignificantly the onset of seizure at all the doses tested. In the PTZ induced seizure test, the extract did not protect the mice against seizure nor mortality but there was a significant (*p< 0.03*) delay in onset of seizure at 100 and 200 mg/kg. Similarly the extract of *Acacia albida* did not protect chicks against MEST. However there was a non significant dose dependent shortening of recovery time at the doses tested. Preliminary phytochemical studies of the stem bark extract of *Acacia albida* revealed the presence of tannins, saponin triterpenes and steroids. The intraperitoneal LD₅₀ in mice was estimated to be 1131.4 mg/kg. Our results suggest that the methanol stem bark extract of *Acacia albida* may contain psychoactive principles that are relevant to the management of epilepsy (petit mal).

Key words: *Acacia albida*, petit mal, traditional medicine, PTZ, MEST, STN.
albida is a large tree 8-15 m high in Senegal and up to 5 m in Nigeria,bole straight to about a third of the overall height by 1m or more in diameter of the dry savanna, but favouring damp sites, often river banks and swamps, common and gregarious from Senegal to Northern Nigeria and extending across Sub-Saharan Africa to East Africa (Burkill, 2000). It is the largest of the African acacias. It shows anthropic organogenetic characters, being common around villages and in past or present areas of cultivation when bush is cleared for agriculture it is left standing. It is widespread in semi-arid Africa on a wide range of soil types and in different climates. The tree is in full leaf during dry season and so reduces ambient air temperature and evaporation during this time. The bark exudes a gum which is sometimes collected in Senegal. It is a form of gum Arabic and has limited medicinal use as an emollient and emulsifier. A fanciful aphrodisial application by pulular folk is reported in Senegal in which the gum is taken with the meat of a bull, possibly the testicles for impotence.

Bark of the trunk is rich in tannins 28-30% and is widely used for tanning skins (Burkill, 2000). An extract of the bark is used for kidney pain and with other drugs for madness (Burkill, 2000). The bark exudes a gum which is sometimes collected in Senegal and is in the form of gum Arabic and has limited medicinal use as an emollient and emulsifier. A fanciful aphrodisial application by pulular folk is reported in Senegal in which the gum is taken with the meat of a bull, possibly the testicles for impotence.

Pharmacy and Therapeutics, Ahmadu Bello University Zaria, Nigeria were used. They were housed under standard conditions of temperature (25±2 C), 12/12 hour light/dark cycle and fed on standard diet (Feeds and Foodstuff, 2005). In addition, day and night cycles of temperature (25±2 C), 12/12 hour light/dark cycle and fed on standard diet (Feeds and Foodstuff, 2005). It is the largest of the African acacias. It shows anthropo genetic characters, being common around villages and in past or present areas of cultivation when bush is cleared for agriculture it is left standing. It is widespread in semi-arid Africa on a wide range of soil types and in different climates. The tree is in full leaf during dry season and so reduces ambient air temperature and evaporation during this time. The bark exudes a gum which is sometimes collected in Senegal. It is a form of gum Arabic and has limited medicinal use as an emollient and emulsifier. A fanciful Aphrodisial application by pulular folk is reported in Senegal in which the gum is taken with the meat of a bull, possibly the testicles for impotence.

**MATERIALS AND METHODS**

Animals. Swiss albino mice (18-25 g) of either sex, collected in Zaria City, Kaduna State, Nigeria. They were identified and authenticated by a taxonomist, Mall. Umair ShUBE Gallah, with the Department of Biological Sciences, Ahmadu Bello University Zaria, Nigeria by comparing with a voucher specimen (No. 900334) deposited for reference at the herbarium section of the Department.

Preparation of the Extract. The bark was carefully removed washed and cut into pieces. The bark was air dried and ground into powder form using mortar and pestle and then sieved. The powdered material was macerated in methanol solution with occasional shaking for 24 h and then filtered. The filtrate was then evaporated to dryness in vacuo at 60°C.

**Test Drugs and Chemicals** Hydroalcoholic stem bark extract, pentylenetetrazole (Sigma Chem. Comp., USA), strychnine (Sigma Chem. Comp. USA), sodium valproate (Sanofi synthelabo) were prepared by dissolving the powder in deionised water prior to administration. Phenobarbital and Strychnine were supplied in ampoules and appropriate dilutions were made with deionised water prior to use.

**Preliminary Phytochemical Screening.** The phytochemical analysis of the methanol stem bark extract of *Acacia albida* was conducted using standard qualitative methods as described by Trease and Evans (1983) and Sosofora (1993).

**Acute Toxicity Studies.** The intraperitoneal median lethal dose (LD₅₀) was evaluated in mice using the method of Lorke (1983). In the initial phase the mice were divided into three groups of mice each and administered with 10, 100 and 1000 mg/kg of the stem bark extract of *Acacia albida* respectively and observed for signs of toxicity and death for 24 hours. In the final phase the mice were divided into four groups of one mouse each and treated with the extract at doses of 200, 400, 800 and 1600 mg/kg i.p respectively. The LD₅₀ value was determined by calculating the geometric mean of the lowest dose that caused death and the highest dose for which the animal survived.

**Diazepam Induced Sleep Test in Mice.** The method described by Rakotonirina et al. (2001) was used. Twenty mice were divided into four groups of five mice each. The first group was treated with normal saline 10 ml/kg i.p, the second, third and fourth groups received graded doses of the extract, 50, 100 and 200 mg/kg i.p respectively. Thirty minutes post treatment, mice in all the groups received diazepam at 20 mg/kg i.p. The time observed between the disappearance and the recovery of the righting reflex was measured as the sleeping time (Miyra et al., 1973). The interval between the times of administration of diazepam to the loss of the righting reflex was recorded as the onset of sleep, while the time from the loss to regaining of the righting reflex as the duration of sleep (Soulimani et al., 2001).

**Maximal Electroshock Test in Chicks.** The method described by Swinyard and Kupfferberg (1985) as adopted by Sayyah et al. (2002) was employed in this study. Fifty day old cockerels were randomly divided into five groups, each containing 10 chicks. The first group was administered normal saline at 10 ml/kg i.p, while the second, third and fourth groups received 50, 100 and 200 mg/kg of *Acacia albida* extract i.p respectively which represents 20-30% of the LD₅₀ dose. The last group received phenytoin 20 mg/kg i.p. Thirty minutes after drug treatment, maximal electroshock was administered to induce seizure in the chicks using Ugo Basile electroconvulsive machine (model 7801) with corneal electrodes placed on the upper eyelids of the chicks. The shock duration, frequency and pulse width were set and maintained at 0.6 s, 100 pulse/second and 0.6 m/s, respectively. A current of about 80 mA, which produced tonic seizures of the hind limb in 80% of control chicks was used throughout the study. Seizures were manifested as hind limb extension (HLE) in the mice (Swinyard, 1969). The ability to prevent this feature or shorten the recovery from the HLE was considered an indication of anticonvulsant activity (Swinyard, 1969; Sayyah et al., 2002).

**Subcutaneous Pentylenetetrazole Induced Seizure Test in Mice.** The method of Swinyard et al. (1984) was employed. Thirty mice were divided into five groups of six mice each. The first group received normal saline 10 ml/kg while the second, third and fourth groups received graded doses of *Acacia albida* bark extract at 50, 100 and 200 mg/kg i.p respectively. The fifth group received phenobarbitone 20 mg/kg as positive control. Thirty minutes post treatment, mice in all the groups received phenytoin 1 mg/kg subcutaneously. The proportion of mice presenting convulsion and the onset of tonic convulsion were recorded. Abolition of tonic extension jerks of the hind limb within 30 minutes after phenytoin administration was regarded as an indication that the extract could prevent pentylenetetrazole-induced convulsion (Raza et al., 2001).

**Statistical Analysis.** The onset of sleep, duration of sleep and onset of seizure were expressed as means± S.E.M. The mean value of control groups were compared to the mean values of groups treated with *Acacia albida* extract using student’s t-test. Values of p<0.05 were considered significant.

**RESULTS**

**Phytochemical analysis**

The preliminary phytochemical analysis of the methanol stem bark extract of *Acacia albida* revealed the presence of tannins, saponins, triterpenes and steroids. Other phytochemicals such as glycosides, alkaloids and flavonoids were not detected (Table 1). **Acute toxicity studies**

The calculated intraperitoneal median lethal dose (LD₅₀) of the stem bark extract of *A. albida* in mice was estimated to be 1131.4 mg/kg.

**Diazepam induced sleep test in mice**

The method described by Rakotonirina et al. (2001) was used. Twenty mice were divided into four groups of five mice each. The first group was treated with normal saline 10 ml/kg i.p, the second, third and fourth groups received graded doses of the extract, 50, 100 and 200 mg/kg i.p respectively. Thirty minutes post treatment, mice in all the groups received diazepam at 20 mg/kg i.p. The time observed between the disappearance and the recovery of the righting reflex was measured as the sleeping time (Miyra et al., 1973). The interval between the times of administration of diazepam to the loss of the righting reflex was recorded as the onset of sleep, while the time from the loss to regaining of the righting reflex as the duration of sleep (Soulimani et al., 2001).

**Subcutaneous Strychnine Induced Seizure Test in Mice.** The method of Porter et al. (1984) was adopted. Thirty mice were divided into five groups of six mice each. The first group received normal saline 10 ml/kg i.p while the second, third and fourth groups received graded doses of *Acacia albida* bark extract at 50, 100 and 200 mg/kg i.p respectively. The fifth group received phenobarbitone 20 mg/kg as positive control. Thirty minutes post treatment, mice in all the groups received phenytoin 1 mg/kg subcutaneously. The proportion of mice presenting convulsion and the onset of tonic convulsion were recorded. Abolition of tonic extension jerks of the hind limb within 30 minutes after phenytoin administration was regarded as an indication that the extract could prevent pentylenetetrazole-induced convulsion (Raza et al., 2001).
Maximal electroshock test in chicks

The methanol stem bark extract of Acacia albida did not protect chicks against maximal electroshock induced convulsion at the doses tested (50, 100 and 200 mg/kg). The mean recovery time at doses of 100 and 200 mg/kg was shortened but not significantly compared to normal saline (Table 2). The standard antiepileptic agent, phenytoin protected 90% of the chicks.

Pentylenetetrazole induced seizure test in mice

The methanol stem bark extract of Acacia albida at doses of 50, 100 and 200 mg/kg did not protect mice against subcutaneous PTZ induced seizure. There was however, a significant (p<0.05) delay in the onset of convulsion at 100 and 200 mg/kg of the extract (Fig. 2). Sodium valproate (200 mg/kg), the standard antiepileptic drug used as control, protected 66.67% of mice against subcutaneous PTZ induced seizure.

Subcutaneous strychnine induced seizure test in mice

The methanol stem bark extract of Acacia albida at the dose of 200 mg/kg showed 50% protection against seizure induced by strychnine. It also exhibited 66.67% protection against mortality. However at doses of 50 and 100 mg/kg the extract offered no protection against seizure but showed 16.33% and 33.33% protection against mortality respectively (Table 3). A insignificant delay in the onset of seizure compared to normal saline was also observed. Phenobarbital (20 mg/kg) protected 83.33% of the mice against seizure and showed 100% protection against mortality.

DISCUSSION

Generally, the data presented here suggested that the methanol extract of Acacia albida contain psychoactive principles that may be useful in the management of epilepsy. Preliminary phytochemical screening of Acacia albida revealed the presence of tannins, flavonoids and saponins amongst others. Phytoconstituents such as tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities. For example tannins, flavonoids and saponins have been shown to modulate central nervous system activities.

Pentylenetetrazole is a known convulsant and anticonvulsant activity in the so-PTZ test identifies compounds that can raise seizure threshold in the brain (White et al., 1998). The PTZ induced seizures are similar to the symptoms observed in the absence seizures and drugs useful in the treatment of absence seizures suppress PTZ induced seizures (Mc Namara, 2006). PTZ has been shown to interact with GABA neurotransmitter and the GABA receptor complex (De Deyn et al., 1992). Ability of the extract of Acacia albida to increase the latency time to onset of seizure in the PTZ test suggested possible interaction of the extract with GABA-ergic neurotransmission and anticonvulsant activity against petit mal epilepsy (Vida, 1995).

The electroshock assay is used primarily as an indication for compounds which are effective in grand mal epilepsy while PTZ induced seizure test identifies primarily compounds that raise seizure threshold and is a fairly good index of effectiveness against absence seizures. petit mal (Rang and Dale, 1995). Protection against HLTE in the MEST predicts anticonvulsant effect that prevents the spread of epileptic seizure discharge from an epileptic focus during seizure activity. Inhibition of HLTE is the common feature of maximal electroshock in rodents, cats, monkeys and humans and the response of rodent brain to the anticonvulsant is similar to that of humans (Swinyard, 1972). There are no false negatives in the MEST and all the currently available anti-epileptic drugs that are clinically effective in the treatment of generalized tonic clonic and partial seizures such as phenobarbital, carbamazepine, oxcarbazepine and lamotrigine also suppress HLTE in MEST (Browning, 1992; Rho and Sankar, 1999). The extract of Acacia albida was only able to shorten recovery period of the chucks, which was not significant and thus, has no effect on grand mal epilepsy.

The findings in this study showed that the stem bark extract of Acacia albida possesses both sedative and anticonvulsant properties, which may account for its use in traditional medicine in management of epilepsy, particularly petit mal.
REFERENCES:


Pharmacological basis of antiepileptic drug action. Epilepsia, 40:1471 1483.


Molecular and Cellular targets for antiepileptic drugs, John Libbey and Company Ltd., pp.191-198.


