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Evaluation of Antistress Potential and Phytochemical Constituents of Aqueous Root Extract of *Alchornea cordifolia*

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Abstract: This study was conducted to evaluate phytochemical component and anti-stress potential of aqueous root extract of *Alchornea cordifolia* in mice. The phytochemical tests showed the presence of flavonoids, tannins, carbohydrates, glycosides, saponins and alkaloids. The antistress activity was evaluated using the forced swimming endurance and anoxic tolerance test. These activities were tested at oral doses of 100-400 mg kg^{-1} of the extract using *Panax ginseng* as experimental control. In the forced swimming test, *A. cordifolia* (100-400 mg kg^{-1}, p.o) significantly prolonged the swimming time in a dose dependent manner. The swimming time (sec) was increased from 313.8±18.24 in the control group to 434.2±20.50 and 531.0±16.58 in groups pre-treated with 200 and 400 mg kg^{-1} of the extract respectively. In the same vein, the extract dose dependently prolonged the mean time (min) to onset of clonic convulsion, the onset of clonic convulsion was increased from 23.6±0.51 in control group to 39.4±1.84 and 52.0±1.30 in groups pretreated with 200 and 400 mg kg^{-1} of the extract, respectively. This ability of *A. cordifolia* to prolong both the swimming time and onset of clonic convulsion, therefore suggest an antistress property.

Key words: Antistress, forced swimming test, anoxic tolerance test, *Alchornea cordifolia*, *Panax ginseng*

INTRODUCTION

Stress is a biological response to aversive conditions such as injury, emotional disturbances. This response consists of reactions that tend to threaten or perturbs the homeostasis of the organisms (Bhattacharya and Ghosal, 2000).

The notion that aversive events may provoke or exacerbate clinical depression in humans is well reported in literature (Weiss *et al*., 1981; Anisman and Zacharko, 1991; Subarnas *et al*., 1993).

We explored the anti-stress potential of *Alchornea cordifolia* and compared it with that of *Panax ginseng* using the forced swimming and anoxic tolerance test as models of stress. The forced swimming test is based on the observation that rats or mice forced to swim in water eventually assumed a characteristic immobile posture devoid of any activity (Weiss *et al*., 1981; Subarnas *et al*., 1993). The appearance of immobility therefore reflects a state of tiredness, fatigue or reduced stamina, a lowered mood (hopelessness). These signs represent some of the core symptoms seen in depressed patient or individual under intense stress (Baldessarini and Tarazi, 2001; Subarnas *et al*., 1993).

The growing popularity of herbal medicine is based on the facts that many people believe that they are safer, 'more natural than synthetic drugs'. Moreover, they are also affordable and more accessible to people (Vandebroek *et al*., 2004).

Furthermore, the belief and cultural ways of life of the people are closely linked with herbal remedial practices (Ashorobi and Umnkoro, 1999).

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Medical plants have been found to posses several phytochemical active compounds. These active compounds possess a wide range of biological activities, which are responsible for the observed curative effects of herbal medicines (Baladrin *et al*., 1993; Cragg and Newman, 2001).

The zeal for continuing to study the traditional sources of medicine has therefore prompted research into the investigation of antistress property of *Alchornea cordifolia*.

Alchornea cordifolia Mull.Arg (Euphorbiaceae) is a widely distributed plant in Africa. It is used in traditional medicine of many African countries for the treatment of bacterial, fungi, parasitic and inflammatory disorder.

Moreover, it has been indicated in wounds, cicatrisation, ulcers (Bouquet and Debray, 1974; Kerhoro and Adam, 1974; Kambu, 1990; Neuwinger, 2000). However, a number of plants such as; *Asparagus racemosu*, *Ocimum sanctum*, *Panax ginseng*, *Hypericum perforatum* etc. have been shown to possess anti-stress properties (Ellis and Reddy, 2002; Bhattacharya and Ghosal, 2000).

No studies have shown anti-stress or endurance promoting activity of *Alchornea cordifolia*. This study therefore, reports on the phytochemical constituents and anti-stress potential of aqueous root extract of *Alchornea cordifolia* in mice.

MATERIALS AND METHODS

Animals

Swiss albino mice (18-25 g) of either sex used in the study were purchased from the Laboratory Animal Centre, College of Medicine, University of Lagos. Lagos, Nigeria. This research work was carried out in 2006. Animals were kept in a well-ventilated environment with free access to food and water *ad libitum*. the ethical guidelines for the handling of experimental animals were followed in the study.

Drugs

Korea *Panax ginseng* (Masons Vitamins Inc., Miami Lakes, Fl 33014, USA) was used as reference drug in this study.

Plant Material

The dried roots of *Alchornea cordifolia* were purchased from Mushin Market, Lagos, Nigeria. Identified and authenticated by Prof. J.A. Olowokudejo of the Department of Botany and Microbiology, University of Lagos, Lagos, Nigeria.

Extraction Procedure

The dried roots of *Alchornea cordifolia* were ground into fine powder. Four hundred grams of the powdered roots were soaked in 650 mL of distilled water for 48 h and the filtrate was evaporated to sticky residues at 38°C. The yield of the extract was 14.5 g with reference to the powdered roots. Four hundred milligram of the residue was dissolved in 10 mL of distilled water for the study.

Experimental Procedure

Forced Swimming Endurance Test

Mice (six per group) were treated with the extract (100-400 mg kg^{-1}, p.o), ginseng (50 mg kg^{-1}, p.o) and distilled water (5 mL kg^{-1}). One hour after pre-treatment, the animals were allowed to swim till exhausted in a propylene tank of dimension (37×37×30 cm), filled with water to a height of 25 cm. The end point was taken when the animals drowned and Swimming time for each animal was noted. The mean swimming time for each group was calculated and the data was statistically analysed (Knmar *et al*., 1999).

Anoxic Tolerance

The method described by Subarnas *et al*. (1993) was used in this study. Mice (six per group) were treated with extract (100-400 mg kg^{-1}, p.o), Ginseng (50 mg kg^{-1}, p.o) and distilled water (5 mL kg^{-1}) one hour before mice were subjected to anoxic stress by keeping them in a confined airtight 250 mL glass jar. The time taken for the mice to exhibit clonic convulsion was taken as the end point. The mice, were thereafter, removed from the glass jar for recovery.

Statistical Analysis

Data obtained from the study were expressed as mean±SEM statistical analysis was performed using ANOVA. p-values less than 0.05 were considered statistically significant.

RESULTS AND DISCUSSION

The extract (200-400 mg kg^{-1}, p.o) produced a significant ($p<0.05$) increase in the duration of swimming in mice.

Similar effects were observed in animals pretreated with *Panax ginseng* (Table 1) in the forced swim test.

In the anoxic tolerance test (Table 2), the extract (200-400 mg kg^{-1}) statistically produced a significant ($p<0.05$) increase in mean time to convulsion in mice subjected to anoxic stress. The phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, carbohydrates, saponins and glycosides.

The results of the study revealed that the extract possess antistress property as it significantly increased swimming time as well as prolongation of the onset of clonic convulsion in animals exposed to anoxic stress.

The forced swimming is the most widely used method for assessing the anti-stress property of a novel compound (Subarnas *et al*., 1993; Anisman and Zacharko, 1991). This paradigm is based on the observation that animals forced to swim in water eventually assumed a characteristic immobile posture, devoid of any activity (Weiss *et al*., 1981).

The appearance of immobility therefore, reflects a state of tiredness, fatigue, reduced stamina with the end point being the moment when the mouse could not swim further and started drowning.

However, increased swimming time has been reported in mice pre-treated with antistress and adaptogenic agents (Bargava and Singh, 1981). This ability of the extract to prolonged swimming time in mice, therefore, suggests an antistress property.

Table 1: Effect of aqueous root extract of *Alchornea cordifolia* in forced swimming endurance test in mice

Treatments	Dose (mg kg^{-1})	Swimming time (sec)
Distilled water control	-	313.8±18.24
Alchornea cordifolia	100	386.2±15.81
Alchornea cordifolia	200	434.2±20.50*
Alchornea cordifolia	400	531.0±16.58*
Panax ginseng	50	614.2±5.32*

Each value represents the mean±SEM for six animals per group. *: $p<0.05$ when compared with distilled water treated group (ANOVA)

Table 2: Effects of aqueous root extract of *Alchornea cordifolia* in anoxic tolerance in mice

Treatments	Dose (mg kg^{-1})	Onset of convulsion (min)
Distilled water	-	23.6±0.51
Alchornea cordifolia	100	31.6±0.93
Alchornea cordifolia	200	39.4±1.84*
Alchornea cordifolia	400	52.0±1.30*
Panax ginseng	50	69.2±3.32*

Each value represents the mean±SEM for six animals per group. *: $p<0.05$ when compared with distilled water treated group (ANOVA)

This study has shown that the extract prolonged mean time to convulsion, which therefore demonstrate antistress property. The prolongation of mean time to convulsion could be attributed to its powerful anti-oxidant and free radical scavenging activities (Oke and Hamburger, 2001).

This ability of *Alchornea cordifolia* to prolonged swimming time and mean time to convulsion suggests that the extract contained phytochemically active constituents i.e., flavonoid and glycoside, which could have increased the level of central neurotransmitter.

The phytochemical screening revealed the presence of alkaloid flavonoid, tannins, saponin, carbohydrate and glucoside. The antistress potential of *Alchornea cordifolia* can be attributed to its flavonoid, carbohydrate, saponins and glycoside contents, they have all been shown to offered protection of cellular component (Rastrelli *et al*., 1998).

The presence of these phytoactive agents may perhaps account for the pharmacological effects demonstrated by *Alchornea cordifolia*.

In conclusion, the results of this study showed that the root extract of *Alchornea cordifolia* possess antistress property.

REFERENCES

Anisman, H. and R.M. Zacharko, 1991. Multiple Neurochemical and Behavioural Consequences of Stressors: Implication for Depression. In: Psychopharmacology of Anxiolytics and Antidepressants. Pergamon Press, New York, pp: 57-82.

Ashorobi, R.B. and S. Umukoro, 1999. The anticonvulsant potentials of Bluestone and its correlation with motor incoordination in mice. West Afr. J. Pharm., 13: 9-11.

Baladrin, M.F., A.D. Kinghorn and W.R. Farnsworth, 1993. Plant Derived from Natural Product in Drug Development. In: Human Medicinal Agents, Kinghorn, A.D. and M.F. Balandrin (Eds.). Am. Chem. Soc., Washington DC., pp: 2-12.

Baldessarini, R.J. and F.I. Tarazi, 2001. Drugs and Treatment of Psychiatric Disorders, Psychosis and Mania. In: Goodman and Gilman, the Pharmacological Basis of Therapeutics, Hardman, J.G. and J.E. Limbird (Eds.). 10th Edn. McGraw Hill, New York, pp: 485-520.

Bargava, K.P. and N. Singh, 1981. Effect of *Ocimum sanctum* on noise induced changes in neutrophil functions. Ind. J. Med. Res., 73: 143-151.

Bhattacharya, K. and S. Ghosal, 2000. Experimental evaluation of the anti-stress activity of a herbal formulation. Zetress. J. Nat. Remedies, 1: 1-7.

Bouquet, A. and M. Debray, 1974. Medicinal Plant of the Ivory Coast. TRAV DOC ORSTOM, 32: 1.

Cragg, G.M. and D.J. Newman, 2001. Natural products drugs discovery in the next millennium. Pharm. Biol., 39: 8-17.

Ellis, J.M. and P. Reddy, 2002. Effect of *Panax ginseng* on quality of Life. Ann. Pharm., 36: 375-379.

Kambu, K., 1990. Element de phytotherapie comparee, plantes medicinales Africanes centre de recherches Pedagogiques. Kinshasa, pp: 6-8.

Kerhoro, J. and J.G. Adam, 1974. Pharmacopiea Senegalaise traditiounelle. Vigot Frere, Paris, pp: 403.

Kumar, R., S.K. Grover, R. Shyam, H.M. Divekar, A.K. Gupta and K.K. Srivastava, 1999. Enhanced thermogenesis in rats by a composite Indian herbal preparation - I and its mechanism of action. J. Alt. Complement Med., 5 (3): 245-251.

Neuwinger, H.D., 2000. African Traditional Medicine. A Dictionary of Plant Use and Applications. Med Pharm, Stuttgart, Germany, pp: 29-30.

Oke, J.M. and Hamburger, 2001. Screening of some Nigeria medicinal plants for anti-oxidants activity using 2,2, diphenyl picryl-hydrazyl radical. Afr. J. Biomed. Res., 5: 77-79.

Rastrelli, L., A. Saravia, C.R. Hernandez and F. Desimone, 1998. Anti-inflammatory activity-guide fractionation of *Gnaophalium strmineum*. Pharm. Biol., 36: 315-319.

Subarnas A., T. Tadano, N. Nakahata, Y. Arai, H. Kinemuchi, T. Oshima, K. Kisara and Y. Ohizumi, 1993. A possible mechanism of antidepressant activity of beta-amyrin palmitate isolated from *Lobelia inflata* leaves in the forced swimming test. Life Sci., 52: 289-296.

Vandebroek, I., J. Calewaert, S. Dejonckheere, S. Sanca, L. Semo, P.V. Damme, L.V. Puyvelde and N.D. Kimpe, 2004. Use of medicinal plants and pharmaceuticals by indigenous communities in the Bolivian Andes and amazon. Bull. WHO., 82: 243-250.

Weiss, J.M., P.A. Goodman, G.O. Losito, S. Corrigan, J.M. Carris and W.H. Bailey, 1981. Behavoural depression produced by Uncontrollable stressor: Relationship to norepinephrine, dopamine and serotonin levels in various regions of rat brain. Brain Rev., 3: 167-205.