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Memory Improving Effect Of *Argyreia Speciosa* In Mice

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ABSTRACT

The present work was undertaken to assess the potential of *Argyreia speciosa* as a nootropic and anti-cholinesterase agent in mice. Elevated plus maze and passive avoidance paradigm were employed to assess short-term and long term memory. The whole brain acetyl cholinesterase activity (AChE) was also assessed. Two doses (100 and 200mg/kg, p.o.) of aqueous extract of *A. speciosa* were administered orally for 6 successive days to both young and aged mice. *A. speciosa* decreased transfer latencies and increased step down latencies in both young and aged mice *A. speciosa* (100 and 200mg/kg, p.o.) successfully reversed amnesia induced by diazepam, scopolamine and natural ageing. *A. speciosa* significantly decreased AChE levels in the whole brain homogenate indicating its potential in the attenuation of learning and memory deficits especially in the aged mice.

KEYWORDS

Amnesia;
Argyreia speciosa;
Acetyl cholinesterase;
Nnootropic, ayurveda.

INTRODUCTION

Alzheimer's disease(AD), the most common form of dementia in the elderly population, is characterized by an insidious onset with memory impairment and an inexorable progression of cognitive decline. Neuropathological examination of AD brain reveals extensive atrophy, accumulation of intraneuronal neurofibrillary tangles[1], and β-amyloid (Aβ) fibrillar deposits (Aβ plaques)[2] in vulnerable regions of the brain (e.g. cortex, hippocampus). It is a large climber grown throughout India. The root is regarded as an alternative tonic and useful in rheumatism and diseases of the nervous system[3]. It is reported to possess anti-inflammatory, anti-arthritic[4], immunomodulatory[5] and anti-stress activity[6]. In the present study

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A.speciosa was investigated for its potential as a nootropic agent in amnesic mice.

MATERIALS AND METHODS

The plant material and preparation of extract

The roots of *Argyreia speciosa* (*A.nervosa Burm*) (Family-convolvulaceae) were obtained from Dharwad, Karnataka, India. The plant was identified at Department of Botany, Karnataka University, Dharwad. The specimen has been kept at Dept.of Pharmacognosy, SET'S college of Pharmacy, Dharwad, Karnataka. The roots were dried in shade; cleaned, powdered and aqueous extract was prepared by simple maceration process using 1000 g of powder. The extract was concentrated using rotary flash evaporator followed by freeze drying. The yield of the dry extract from crude powder of *A.speciosa* was 1.5%. A suspension was prepared using tween 80 and administered orally.

Animals

Swiss mice of either sex weighing around 18 g (younger, 8 weeks old) and 25 g (older, 28 weeks old) were used. Animals were procured from disease free animal house, BLDEA Medical College, Bijapur.

Memory models

Exteroceptive behavioral model

a) Elevated plus maze

The elevated plus maze served as the exteroceptive behavioral model (where in stimulus existed outside the body) to evaluate learning and memory in mice. Transfer latencies (TL) were determined[7-9].

b) Passive avoidance paradigm

Passive avoidance paradigm was used to assess long term memory in mice. Step down latencies (SDL) were determined[10, 11].

Estimation of brain acetyl cholinesterase (AChE) activity

On the 7th day animals were euthanized by cervical dislocation and whole brain AChE activity was measured using the Ellman method[12]. Protein estimation was done using Folin's method.

Statistical analysis

All the results were expressed as mean ± standard error. The data was analyzed using ANOVA followed by Tukey-kramer test. $P<0.01$ was considered as statistically significant.

RESULTS

Effect on transfer latency (TL) using elevated plus maze

Piracetam (200mg/kg, i.p.) treatment for 6 days decreased transfer latency on 6th day and after 24 hours i.e. on 7th day as compared to control group, indicating improvement in both learning and memory. Scopolamine (0.4mg/kg, i.p.) and diazepam (1mg/kg, i.p.) increased TL significantly ($P<0.01$) in young mice on first and second day as compared to control, indicating impairment of memory.

A.speciosa (100 and 200mg/kg, p.o.) decreased the TL on 6th day and 7th day in young and aged mice ($P<0.01$) when compared to control groups (Figure 1). It also reversed amnesia induced by scopolamine and diazepam significantly (Figure 2).

Effect on SDL using passive avoidance apparatus A

Speciosa extract (100 and 200mg/kg, p.o.) profoundly increased SDL significantly as compared to control group on second day indicating improvement in memory of young mice (Figure 3). Furthermore, this dose of *A.speciosa* reversed diazepam, scopolamine induced amnesia as well, like in the elevated plus maze model (Figure 4).

Effect on whole brain acetylcholine (AChE) activity

The whole brain AChE activity with phenytoin (12mg/kg, i.p.) exhibited significant elevation to AChE activity as compared to control and piracetam (200 mg/kg, i.p.). *A.speciosa* (100 and 200mg/kg, p.o.) significantly reduced AChE activity (Figure 5).

DISCUSSION

Alzheimer's disease has been identified as a protein misfolding disease due to the accumulation of abnormally folded amyloid beta protein in the brains of AD patients[13].

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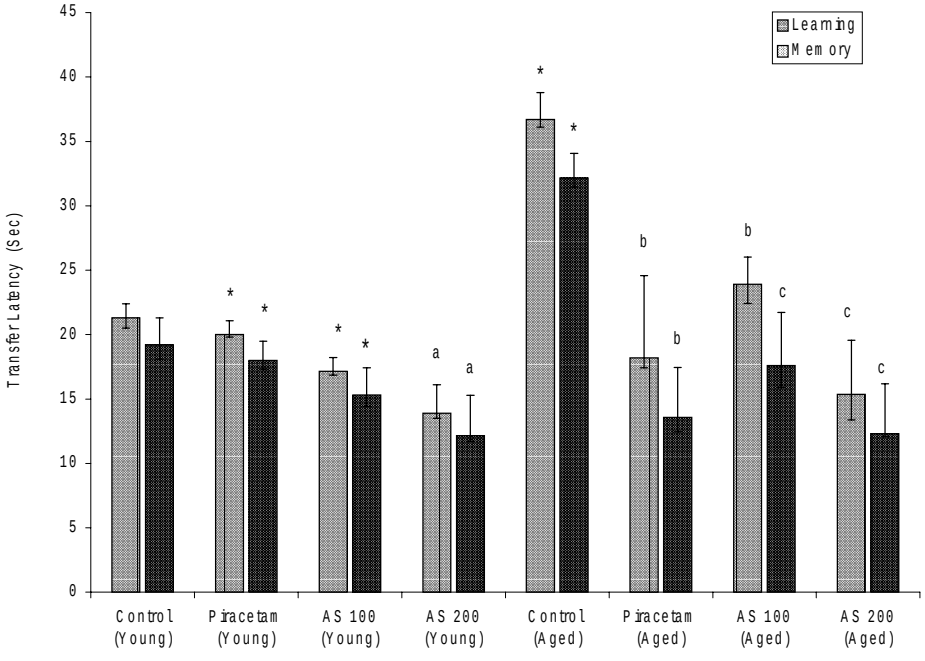
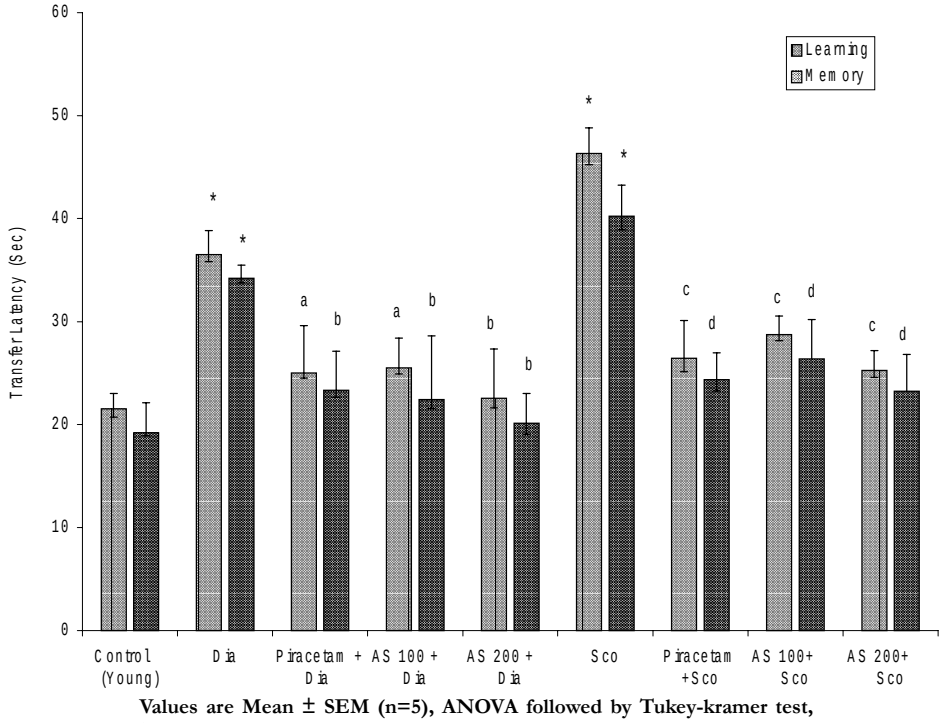


Values are Mean ± SEM (n=5), ANOVA followed by Tukey-kramer test.

* P<0.01 compared to control (Young mice), [a] P<0.001 compared to control (Young mice), [b] P<0.01 compared to control (Aged mice), [c] P<0.001 compared to control (Aged mice)

Figure 1: Effect of *A. speciosa* (AS) on transfer latency of young and aged mice. Piracetam (200 mg/kg, i.p.) was used as standard drug



Values are Mean ± SEM (n=5), ANOVA followed by Tukey-kramer test,

[a] P<0.01 compared to diazepam, [b] P<0.001 compared to diazepam, [c] P<0.01 compared to scopolamine, [d] P<0.001 compared to scopolamine.

Figure 2 : Effect of *A. speciosa* (AS) on TL in scopolamine and diazepam induced amnesia. Piracetam (200 mg/kg, i.p.) was used as standard drug

In AD patients, hyperphosphorylated tau accu- mulates as paired helical filaments[14], that in turn

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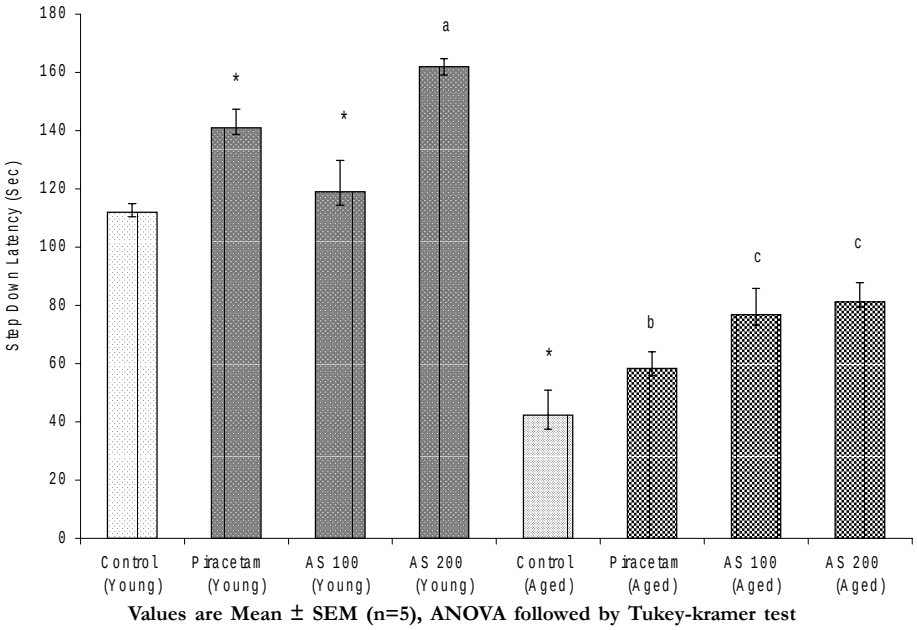
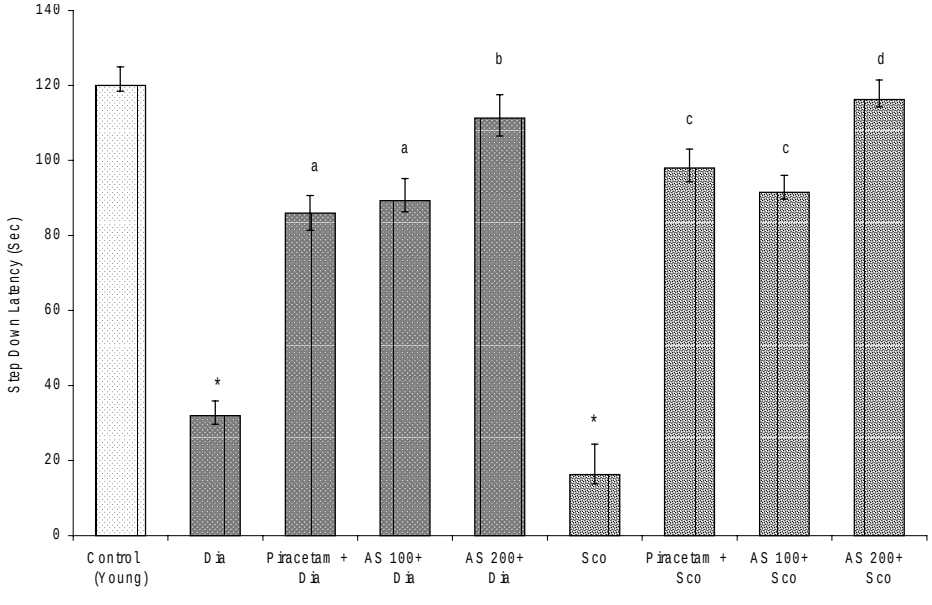


Values are Mean ± SEM (n=5), ANOVA followed by Tukey-kramer test

***P<0.01 compared to control (Young mice), [a] P<0.001 compared to control (Young mice), [b] P<0.01 compared to control (Aged mice), [c] P<0.001 compared to control (Aged mice)**

Figure 3: Effect of *A. speciosa* (AS) on SDL of young and aged mice.Piracetam (200 mg/kg, i.p.) was used as standard drug



Values are Mean ± SEM (n=5), ANOVA followed by Tukey-kramer test,

[a] P<0.01 compared to diazepam, [b] P<0.001 compared to diazepam, [c] P<0.01 compared to scopolamine, [d] P<0.001 compared to scopolamine

Figure 4: Effect of *A. speciosa* (AS) on SDL in scopolamine and diazepam induced amnesia. Piracetam (200 mg/kg, i.p.) was used as standard drug

aggregate into masses inside nerve cell bodies known as neurofibrillary tangles.

Current treatments for AD have only moderate symptomatic effects on the disease[15]. The present study indicates that *A.speciosa* is a potential anti-cholinesterase agent. It also possesses nootropic activity in view of its facilitatory effect on retention of acquired learning. *A.speciosa* decreased transfer latencies, increased SDL in mice when subjected to passive avoidance paradigm, indicating its potent anti

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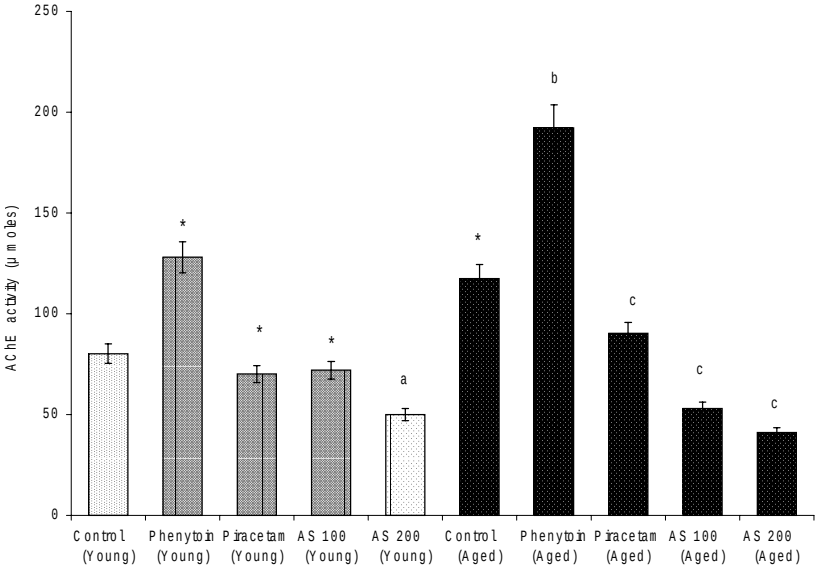

Values are Mean ± SEM (n=5), ANOVA followed by Tukey-kramer test, *P<0.01 compared to control (Young mice), [a] P<0.001 compared to control (Young mice), [b] P<0.01 compared to control (Aged mice), [c] P<0.001 compared to control (Aged mice)

Figure 5: Effect of *A.speciosa* (AS) on AChE activity of young and aged mice. Piracetam (200mg/kg, i.p.) was used as standard drug. Phenytoin was the negative control

amnesic activity. AS also reversed the diazepam, scopolamine and ageing-induced memory impairments. Central cholinergic system plays an important role in learning and memory[16]. Phenytoin is known to reduce hippocampal AChE concentration[17] and causes cognitive impairment[18]. In our study, phenytoin per se (12mg/kg, i.p.) significantly elevated brain AChE activity. Piracetam (200mg/kg, i.p.) and AS (100 and 200mg/kg, p.o.), on the other hand significantly (P<0.01) lowered this activity indicating the counteracting action of the two drugs on the cholinergic system. Hence A. speciosa can be used for the management of AD and other cognitive disorders.

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