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Anxiety Curing Evaluation with the Aqueous Extract of *Securidaca longepedunculata* (*Polygalaceae*) *Decoction* in Mice on the Stress Paradigm Tests

Jean Pierre Omam Omam[1, *], Samuel Mbouh[2], Antoine Kavaye Kandeda[3], Juliette Koube[4], Djibrilla Mana Moussa[4], Mireille Delphine Minkoulou Ze[3], Ronald Bidingha à Goufani[3], Alain Mbom[4], Fleur Clarisse Okomolo Moto[1], Elisabeth Ngo Bum[5, 6]

[1]Department of Biological Sciences, High Teacher Training College University of Yaounde I, Yaounde, Cameroon

[2]National Institute of Youth and Sports, Yaounde, Cameroon

[3]Department of Animal Biology and Physiology, Faculty of Sciences, University of Yaounde I, Yaounde, Cameroon

[4]Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon

[5]Department of Biological Sciences, Faculty of Sciences, University of Ngaoundere, Ngaoundere, Cameroon

[6]Department of Biological Sciences, University of Maroua, Maroua, Cameroon

Email address:

jpbolikol@yahoo.fr (Jean Pierre Omam Omam)

[*]Corresponding author

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Abstract: *Securidaca longepedunculata* is a plant which various parts are widely used in traditional medicine. Its roots are used to treat snakebite. Beyond its efficacy for snakebite treatment, S. *longepedunculata* is used for the treatment of other diseases including dysentery, stomach ache and mental disorders. The interest of the present study was to investigate the anxiolytic properties of *S. longepedunculata* roots decoction. The plant material of our study consisted of *S. longepedunculata* roots. The animal material consisted of male and female *Mus musculus* Swiss mice of 18 g and above, approximately 9 weeks old and not previously tested. They were used for the acute toxicity assessment following OECD 425 protocols. Then the evaluation of the anxiolytic activity of the decoction on acute and chronic anxiety was done using the following paradigms: Elevated Plus Maze (EPM), Open Field (OF), Hole Board (HB) and the Restrictor. Finally, some oxidative stress parameters such as catalase, sulfoxide dismutase, reduced glutathione and malondialdehyde were measured. The plant screening revealed the presence of phenolic compounds like flavonoids, saponosides and triterpenes. There were no signs of toxicity at the dose of 5000 mg/kg fourteen (14) days after treatment. The evaluation of the anxiolytic activity of this decoction on acute and chronic anxiety through the different tests showed that, the most effective dose of *S. longepedunculata* decoction was 213 mg/kg. In the EPM test, there was a significant ($p<0.001$) increase of the number of entries into the open arms entries from 7±1.30 in the negative control mice to 36 ±3.16 in the (Sl 213 mg/kg) group. The Diazepam also induced a significant ($p<0.001$) increase of this number. The time spent in the open arms and their respective percentages were equally increased. However, there was also a significant ($p<0.001$) decrease of the number of entries and the time spent in the closed arms and their percentages indicating a decrease of the level of anxiety in these mice. The OF and HB tests also showed that, the *S. longepedunculata* decoction would possess anxiolytic properties. This could be justified by the presence of secondary metabolites such as saponins and flavonoids. These results justify the use of *S. longepedunculata* roots in the traditional medicine for the treatment of mental disorders. It would be beneficial to suggest them to local populations against these pathologies.

Keywords: *Securidaca longepedunculata*, Decoction, Anxiolytics, Antioxidant

1. Introduction

Anxiety is considered as a distressing emotional state characterised by feelings of worry, fear and confusion due to recurrent memories of trauma and a state of difficulty falling asleep followed by recurrent nightmares [1]. It is a major public health problem worldwide. Studies conducted for many countries in the general population have determined a prevalence of anxiety disorders of 9%, 12%, and 64.3% respectively in the United States, Canada and France [2-4]. However, there is little data on this subject in Africa; a study carried out in Mali in the internal medicine department of the Point G hospital estimated the prevalence of anxiety disorders to 23.02% [5]. The same statistical data are observed in Jamot's Hospital patients in Cameroon. Anxiety disorders are frequent and lead to multiple and potentially serious complications as well as social and professional repercussions [6, 7]. The treatment of anxiety disorders involves the benzodiazepine family substances (e.g. diazepam, nitrozepam, lorazepam, alprazolam), barbiturates family substances like phenobarbital with serotonin reuptake inhibitors (SSRIs) (sertraline, paroxetine, fluoxetine) being the most commonly prescribed [6]. However, these modern treatments are expensive, complex and inaccessible for African populations in rural areas [7, 8]. Many of these psychoactive molecules have plant origins and in Africa medicinal plants are invaluable resources for the majority of rural populations, where more than 80% use them for their primary health care [4], which could justify the use of plants in traditional African medicine to treat neuropsychiatric diseases [9, 10]. In order to valorise medicinal plants and to contribute for scientific research, we focused on the species *S. longepedunculata*. This polygaceae is calling "mother of medicine" by local populations. Their roots treat many deseases like diarrhea, estomac pains, dysenteria, intestinal parasits, head pains and hepatitis. In this study, we have evaluated anxiolytic and antioxidant effects of *Securidaca longepedunculata* decoction roots in mice exposed in the classical paradigms and chronic immobilisation test [10].

2. Material and Methods

2.1. Material

2.1.1. Plant Material

The roots of *S. longepedunculata* were collected in North Cameroon, precisely in the Mayo Louti department, Figuil district and town. The identification of the plant was carried out at the national herbarium of Cameroon in Yaounde. The sample was identified with comparison material number 433 of P. MAlzy specimen corresponding to the Herbarium collection number 15262/ SRF.cam.

2.1.2. Animals

Both male and female *Mus musculus* Swiss mice that had not been previously tested were used in our study. The weight of these mice was on average 20 g and older at about 9 weeks of age were used randomly. The Inclusion criteria were: physically healthy, non-pregnant adult mice weighing 20-30 g. Then the exclusion criteria were: Mice with physical or behavioural abnormalities and these used in other experiments.

Figure 1. *Mice during the acclimatisation period in the animal house of the Heigher teacher training college of Yaounde, Cameroon (Omam, 2022).*

2.2. Methods

2.2.1. Plant Screening

In order to detect compounds belonging to the chemical families of secondary metabolites contained in *S. longepedunculata* decoction, specific tests based on staining and precipitation reactions were carried out using the methods described by Harbone in 1998 [11].

2.2.2. Preparation of the Aqueous Extract of Securidaca longepedunculata Roots

The roots of *S. longepedunculata* were dried for 60 days at room temperature. After grinding, there has obtained the powder. 40 g of this root powder was introduced into an Erlen-meyer and completed with 400 ml of distilled water for 100 mg/ml of concentration to the dose of 1000 mg/kg. Subsequently, the Erlen-meyer was closed and boiled for 20 min on a hot plate. After cooling, the mixture was filtered through Watmann paper N°3 and the collected filtrate was considered as the stock solution. The dilutions have been done by ½, 1/4 and 1/10 factors in order to determinate the doses of administered decoction. In other case, the filtrate obtained was kept in dried at 45°C in the oven to obtain a dry extract mass. This has used to determinate the yield of the extraction. So, there gave us a yield of 13.33%. The solutions were administered to the animals at a volume of 10 ml/kg of body weight [11].

2.2.3. Evaluation of Anxiolytic Properties in the Elevated Plus Maze Test

The Elevated Plus Maze (EPM) used is the one described by Handley and Mithiani in 1984 [12]. It is at a height of 50 cm from the ground and consists of two opposite open arms (15 × 5 cm) and two opposite closed arms (15 × 5 × 10 cm) with a platform in the centre. The test was conducted in a quiet room with daylight. The principle of the test is based on the approach/avoidance conflict of the open arms. An animal that explores the open arms were described as 'low anxiety' and an animal that remains confined to the closed arms of the

device were described as 'anxious' [12]. The EPM test was carried out according to the method of Rodgers and Dalvi in 1997. This test is based on the study of the animal's spontaneous behaviour in the anxiety-provoking EPM paradigm. At each period, the experimental device was cleaned with ethyl alcohol (70°C). The classical variables were measured. Among them, the number of entries and the time spent in the different arms of the maze, the number of head dipping were also recorded. From these data, the percentage of the number of entries in the open arms of the EPM was determined as the ratio of the number of entries in the open arms to the number of entries in all arms of the EPM, multiplied by 100. The percentage of time spent in the open arms of the paradigm is calculated as the ratio of the time spent in the open arms to the experimental time, multiplied by 100. The criteria for entering an arm are that all four legs of the animal must have entered the arm. The criteria for exiting an arm are that the animal should have at least two legs out of the arm [12]. The mice, arranged in 6 groups of 5 animals each, were treated with distilled water (10 ml/kg) for the negative control group, diazepam (3 mg/kg; i.p.) for the positive control group and different doses of *S. longepedunculata* decoction (213 mg/kg; 106 mg/kg; 53 mg/kg; 21 mg/kg; p.o.) for the test groups. One hour after the administration of the different treatments, the mice were placed one after the other in the centre of the maze platform. The behaviour of each mouse was observed for a period of 5 minutes [12, 13].

2.2.4. Evaluation of Anxiolytic Properties in the Open Field Test

The Open Field (OF) is a square enclosure with eleveted edges, illumited at the centre, which does not allow the animal inside to escape or hide. The exploration surface is divided into 17 tiles: 16 tiles dividing the interior surface of the experimental paradig and one central tile. The dimensions of the OF were 40 cm square and 19 cm high [13]. The OF test is commonly used to assess locomotor activity, exploration and emotional reactivity in rodents. The mice were evenly divided into six groups of five animals each. These animals were treated with distilled water for the negative control, with different doses of S. longepedunculata decoction (213 mg/kg; 106 mg/kg; 53 mg/kg; 21 mg/kg; p.o.) for the test groups and diazepam (3 mg/kg; i.p.) for the positive control. After administration of the different substances, the mice were returned to their original cages to reduce neophobic responses due to the experimental environment [13]. One hour after the administration of the different substances to the mice, they were placed one after the other in the centre of the experimental paradigm. The behaviour of each mouse was observed and noted for a period of 5 minutes. Among parameters recorded, there were the number of crossings and the time spent in Centre. Also the number of crossings, groomings. After 5 minutes of observation, the mouse was returned to its original cage and the experimental device was cleaned with ethyl alcohol (70°C).

2.2.5. Evaluation of Anxiolytic Properties in the Hole Board Test

The experimental device used in this test is a board of 40 × 40 × 2.2 cm dimensions. It has 16 holes of 3 cm diameter. The hole board (HB) is raised 25 cm above the ground. The principle is based on an unconditioned conflict between a motivation to explore the new situation and a tendency to show fear/anxiety behaviours towards this newness that is the hole board [13,14]. The hole board is a paradigm designed to study the behaviour of mice in a new environment. One hour after the administration of the different treatments, the mice were placed one after the other in the centre of the hole board and several behavioural parameters were observed and recorded for a period of 5 minutes. Among these parameters were the latency time of the first head dipping and the number of head dipping. Also recorded the number of groomings and rearing. The experimental paradigm was cleaned each time with ethyl alcohol before the start of each test. The mice were divided into 06 groups of 05 animals and were treated with distilled water (10 ml/kg; p.o.) for the negative control group, different doses of *S. longepedunculata* decoction (213 mg/kg; 106 mg/kg; 53 mg/kg; 21 mg/kg; p.o.) for the test groups and diazepam (5 mg/kg; i.p.) for the positive control group, [14].

2.2.6. Evaluation of Anxiolytic Properties by Chronic Immobilisation Stress Test

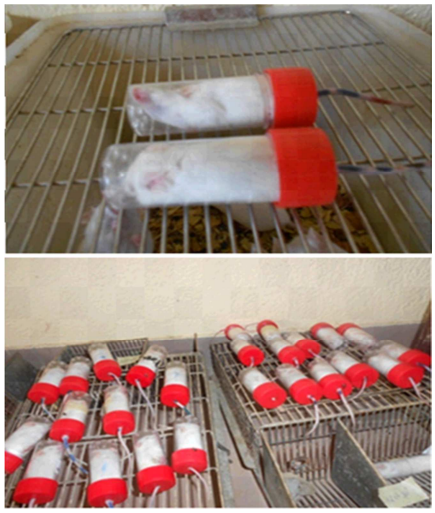


Figure 2. *Restrictors of mice of chronic immobilisation stress test (Omam, 2022).*

In order to induce chronic stress, 06 mice per group were placed in a rodent restrictor as described by Mei *and* collaborators then Omam in 2018 [15]. The animals were subjected to repeated immobilisation stress by chronic immobilisation stress (SIC) which consists of completely immobilising them in a narrow tube called the restrictor. The restrictor is a cylindrical Plexiglas tube 3 cm in diameter and 8 cm high. This device does not give the animal any possibility of mobility, hence the term restraint stress or immobilisation. During the test, the animals had no access to food or water. Then, animals were subjected to the restriction

each day for a period of 2 hours in succession for 10 consecutive days. In order to rule out the possibility of habituation behaviour developing in the mice, immobilisation was carried out at varying times [15].

The treatments were administered 30 minutes before immobilisation during the entire period of the stress induction procedure. The animals were divided into 07 homogeneous groups of 06 mice each. The distribution of groups according to the treatments: The different groups were treated successively with distilled water (*p o*) for the normal control and the stressed negative control groups, the different doses of the decoction (213 mg/kg; 106 mg/kg; 53 mg/kg; 21 mg/kg; p.o) for groups and diazepam for the positive control group. Twenty-four hours after the last stress, the mice were treated and one hour after these treatments, the anxiolytic effect of *S. longepedunculata*. The body weight of the animals was recorded every day during the stress period. Twenty-four hours after the last stress, the different doses of the decoction (213 mg/kg; 106 mg/kg; 53 mg/kg; 21 mg/kg; p.o) and diazepam were administered to the animals. One hour after these treatments, the anxiolytic effect of *S. longepedunculata* decoction was assessed in mice placed on the elevated plus maze followed by the open field test. The classical behavioural parameters for measuring anxiety were observed for a period of 5 minutes [15].

2.2.7. Statistics

Values were expressed as mean ± SEM (Standard Error of the Mean). All data were analysed by one way analysis of variance (ANOVA). Post hoc tests were then performed using Dunnet's or Turkey's test by graphpad Insert or Prism, with the level of significance set at P<0.05.

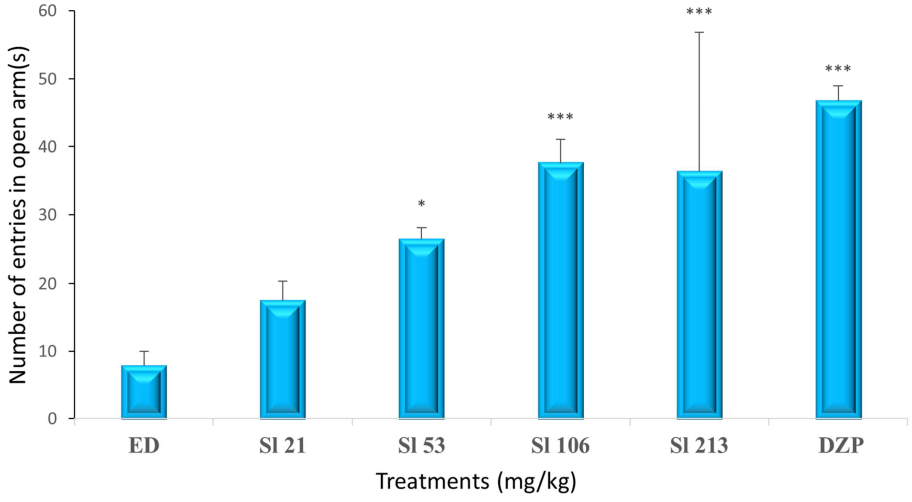
3. Results

3.1. Anxiolytic Effects of Securidaca longepedunculata Decoction on the Elevated Plus Maze

During the 5 minutes observation of each mouse, the figure 3A shows that S. longepedunculata decoction induced a significant (p<0.001) increase of the number of open arm entries from 7±1.30 in the negative control mice to 36 ±3.16 in those of the group treated with the dose of 213 mg/kg. The diazepam also induced a significant (p<0.001) increase of this number. The figure 3B shows that S. longepedunculata decoction induced a significant (p<0.001) increase of the time spent in open arms from 92.2±12.97 in the negative control mice to 246.4 ±9.28 s in those of the group treated with the dose of 213 mg/kg. The diazepam also induced a significant (p<0.001) increase of this number. The figure 3C shows that, this plant decoction induced a significant (p<0.001) increase of percentage of time spent in open arms from 30.73% in the negative control mice to 82.13% in those of the group treated with the dose of 213 mg/kg. The diazepam also induced a significant (p<0.001) increase of this number. Finally, the figure 3D shows that, S. longepedunculata decoction induced a significant (p<0.001) decrease of percentage of time spent in closed arms from 207.8 ± 21,13 in the negative control mice to 53.6 ±7.89 in those of the group treated with the dose of 213 mg/kg. The diazepam also induced a significant (p<0.001) decrease of this number to 49 ± 8.12.

3.2. Anxiolytic Effects of Securidaca longepedunculata Decoction on the Open Field

The figure 4A shows that *S. longepedunculata* decoction induced a significant (p<0.001) increase of time spent in the centre from 1±0.70 s in the negative control mice to 11,8 ±1.9 s in those of the group treated with the dose of 213 mg/kg. Diazepam also induced a significant (p<0.001) increase of this time to 11,8 ±1.9 s. The figure 4B shows that *S. longepedunculata* decoction induced a significant (p<0.001) increase of crossings from 44.2±5.11 in the negative control mice to 168 ± 9.73 in those of the group treated with the dose of 213 mg/kg. Diazepam also induced a significant (p<0.001) increase of this parameter to 169.8±11.03. The figure 4C shows that S. longepedunculata decoction induced a significant (p<0.001) decrease of stool mass from 4.2±0.83 g in the negative control mice to 0.4 ±0.54 g in those of the group treated with the dose of 213 mg/kg. Diazepam also induced a significant (p<0.001) decrease of stool mass.



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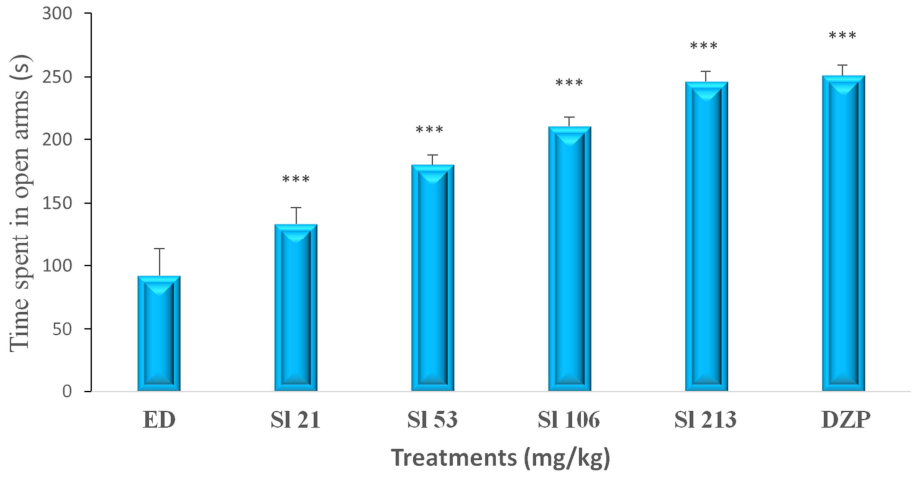

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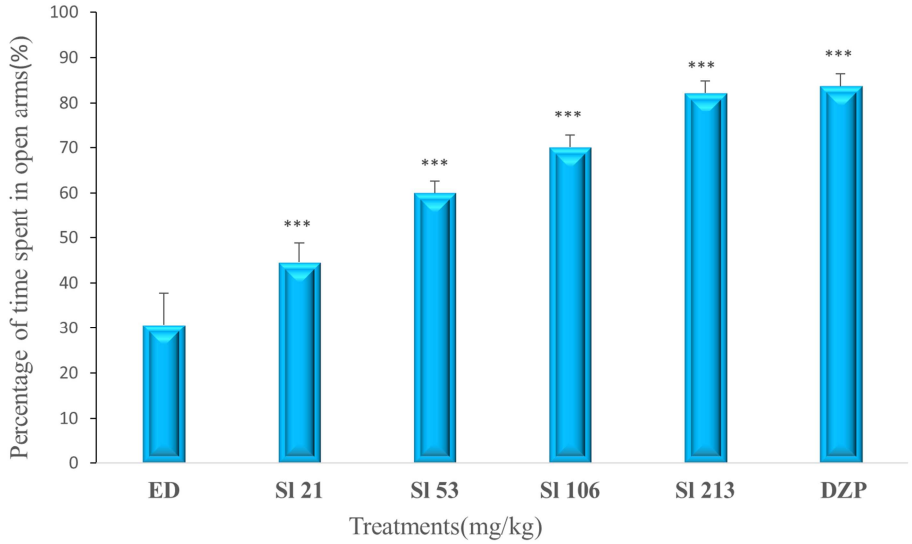

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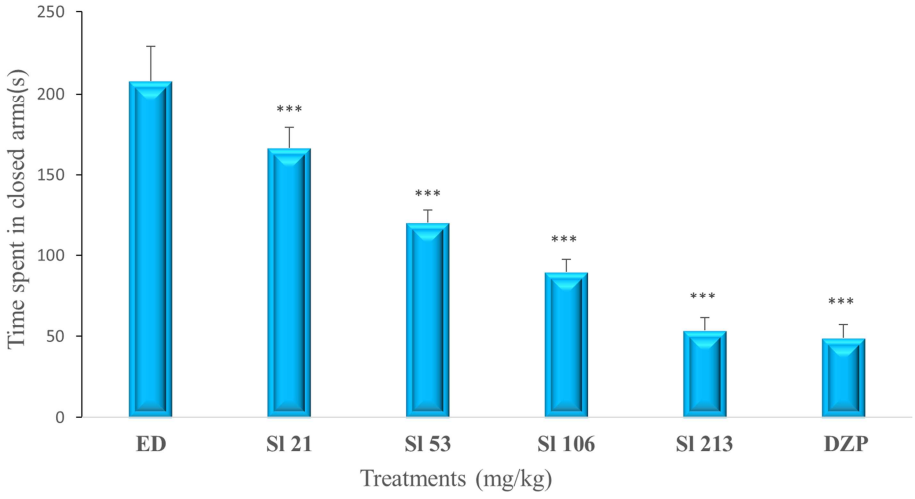
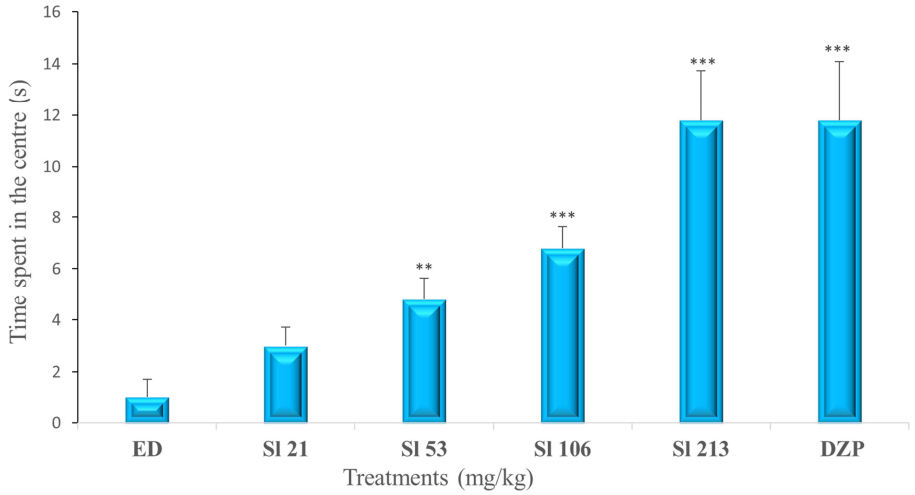


D

Figure 3. *Anxiolytic properties of Securidaca longepedunculata decoction on the EPM. A (on the number of entries in the open arms); B (on the time spent in the open arms); C (on the percentage of time spent in the open arms); D (on the time spent in the closed arms). Each bar represents the parameters of the EPM, n = 5. ***p<0.001; significant difference from negative control; ED: distilled water; SL21, Sl53, Sl106, Sl213: different doses of Securidaca longepedunculata; DZP: Diazepam at 3 mg/kg.*



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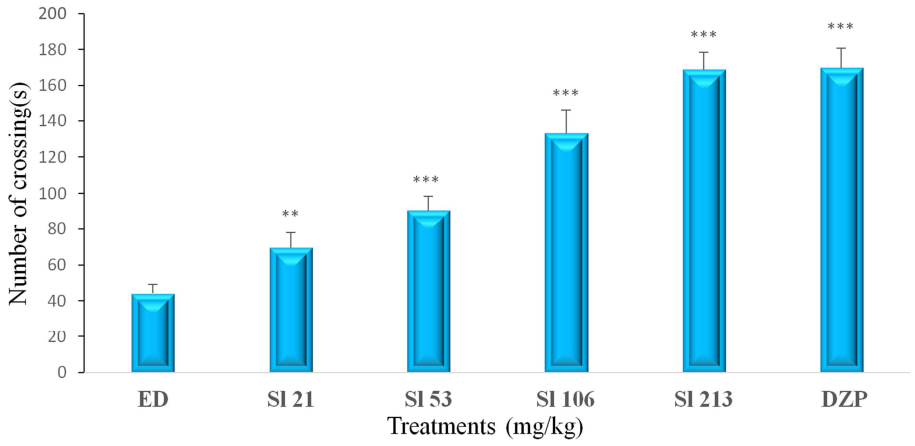

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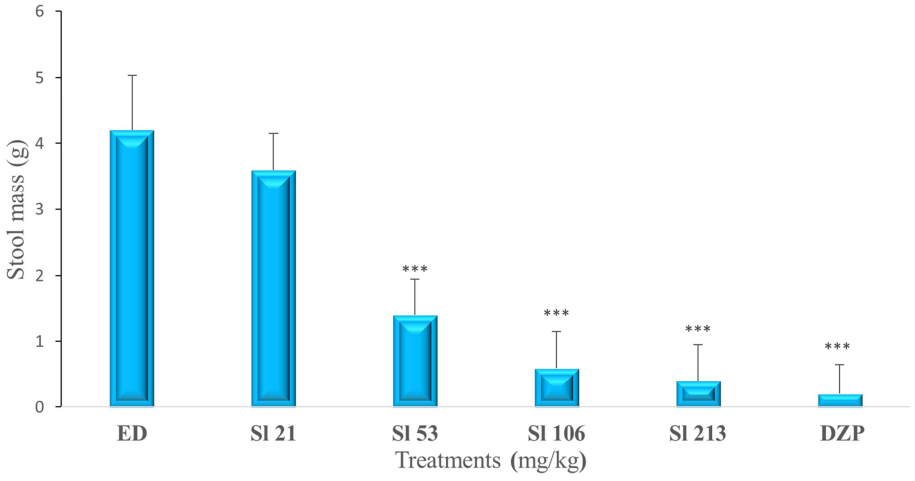


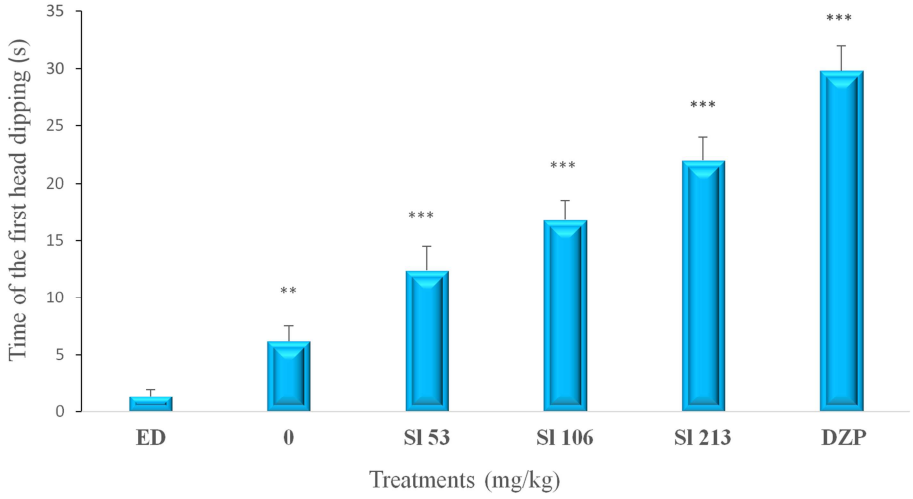
C

Figure 4. *Anxiolytic properties of Securidaca longepedunculata decoction on the Open Field. A (on the time spent in the Centre); B (on the number of crossings); C (on the stool mass of mice); Each bar represents the parameters of the OF, n = 5. ***p<0.001; significant difference from negative control; ED: distilled water; SL21, Sl53, Sl106, Sl213: different doses of Securidaca longepedunculata; DZP: Diazepam at 3 mg/kg.*

3.3. Anxiolytic Effects of Securidaca longepedunculata Decoction on the Hole Board

The figure 5A shows that *S. longepedunculata* decoction induced a significant ($p<0.001$) increase of time of first head dipping from 1.4 ±0. 54 s in the negative control mice to 22 ± 2 s in those of the group treated with the dose of 213 mg/kg. Diazepam also induced a significant ($p<0.001$) increase of

time of first head dipping to 29.8±2 s. Then the figure 5B shows that the decoction of S. Longepedunculata decoction induced a significant ($p<0.001$) increase of number of head dipping from 5.4±0.54 in the negative control mice to 28.4±0.44 in. in those of the group treated with the dose of 213 mg/kg. Diazepam also induced a significant ($p<0.001$) increase of this number to 30.4±0.44.



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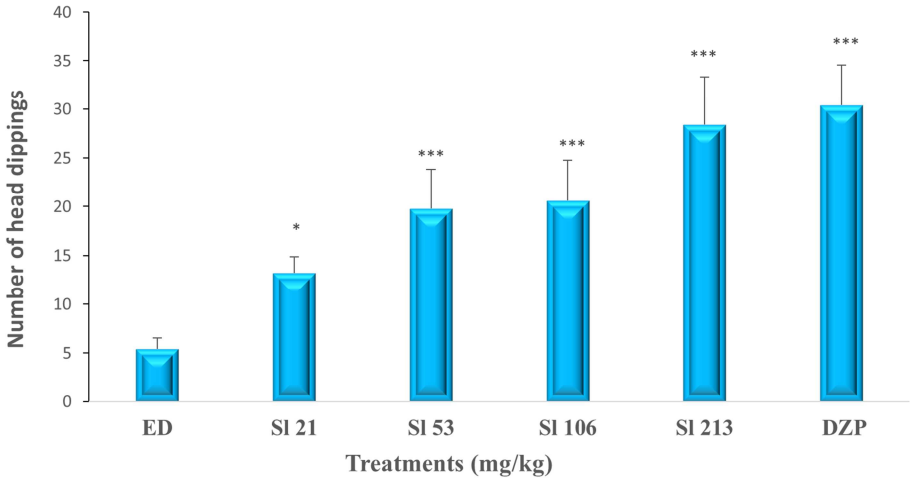


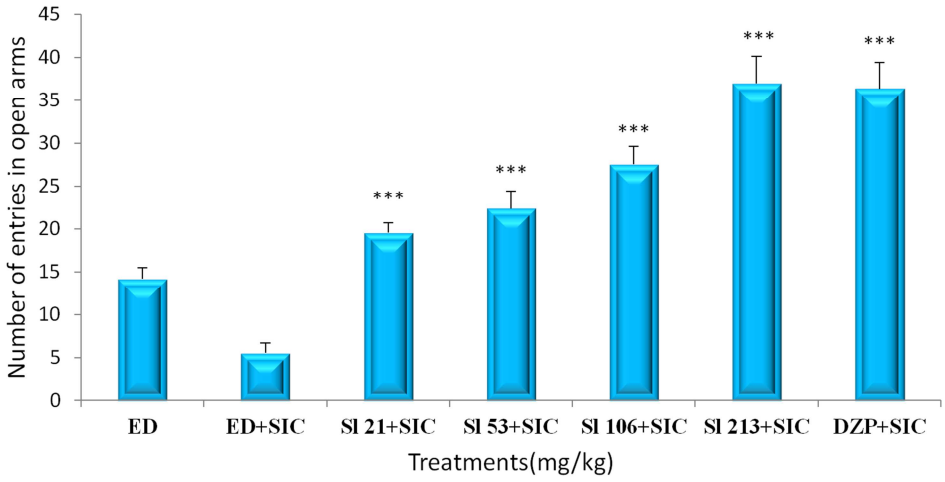
B

Figure 5. *Anxiolytic properties of Securidaca longepedunculata decoction on the Hole Board. A (on the time of the first head dipping); B (on the number ofhead dippings). Each bar represents the parameters of the HB, n = 5. ***p<0.001; significant difference from negative control; ED: distilled water; SL21, Sl53, Sl106, Sl213: different doses of Securidaca longepedunculata; DZP: Diazepam at 5 mg/kg.*

3.4. Anxiolytic Effects of Securidaca longepedunculata Decoction by Chronic immobilisation Test on the EPM and OF

The Figure 6A shows that the SIC caused a non-significant decrease of the number of open arm entries from 14.2±1.30 in the normal control mice to 5.6 ±1.14 in the negative control. The decoction of *S. longepedunculata* induced a significant ($p<0.001$) increase of this number from 5.6 ±1.14 in the negative control mice to 37±3.13 in these of the group treated with the dose of 213 mg/kg. The diazepam at dose of 2 mg/kg induced a significant ($p<0.001$) increase of the number of entries into the open arms. Also the Figure 6B shows that the SIC caused a significant ($p<0.001$) increase of the number of entries into the closed arms from 17.6 ± 2.12 in the normal control mice to 39±2 in the negative control. The decoction of *S. Longepedunculata* induced a significant decrease ($p<0.001$) of this number from 39±2 in the negative control to 8.8±0.84 in these of the group treated with the dose of 213 mg/kg. Diazepam at 2 mg/kg also induced a significant ($p<0.001$) decrease of the number of entries into the closed arms. Then the Figure 6C shows that the SIC caused a significant decrease ($p<0.001$) of the number of crossings from 64.4 ± 6.02 in the normal control mice to 28.2 ± 2.48 in the negative control. The decoction of *S. Longepedunculata* induced a significant increase ($p<0.001$) of this number from 28.2 ± 2.48 in the negative control to 122 ±7.12 in these of the group treated with the dose of 213 mg/kg. The end, the Figure 6D shows that the SIC caused a

significant decrease ($p<0.001$) of the time spent in the centre from 13 ± 2 s in the normal control mice to 3.6 ±0.54 s in the negative control. The decoction of *S. Longepedunculata* induced a significant increase ($p<0.001$) of this number from 3.6 ±0.54 s in the negative control to 52.4 ±2.30 s in these of the group treated with the dose of 213 mg/kg. The diazepam at dose of 2 mg/kg induced also a significant ($p<0.001$) increase of this time to 52 ±3. 67.



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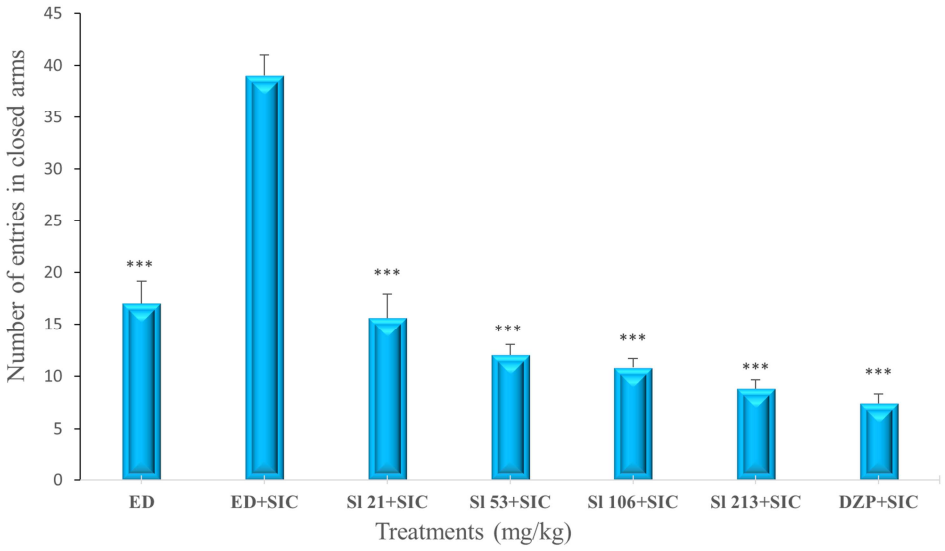

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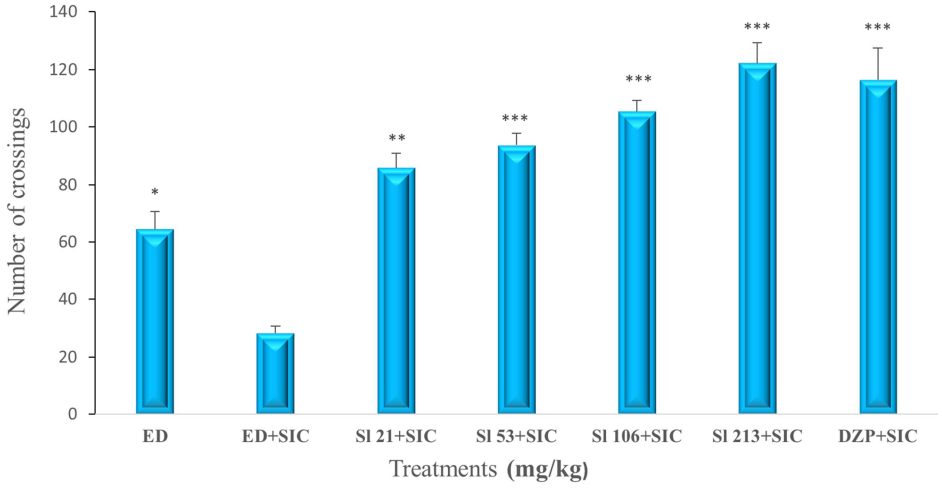

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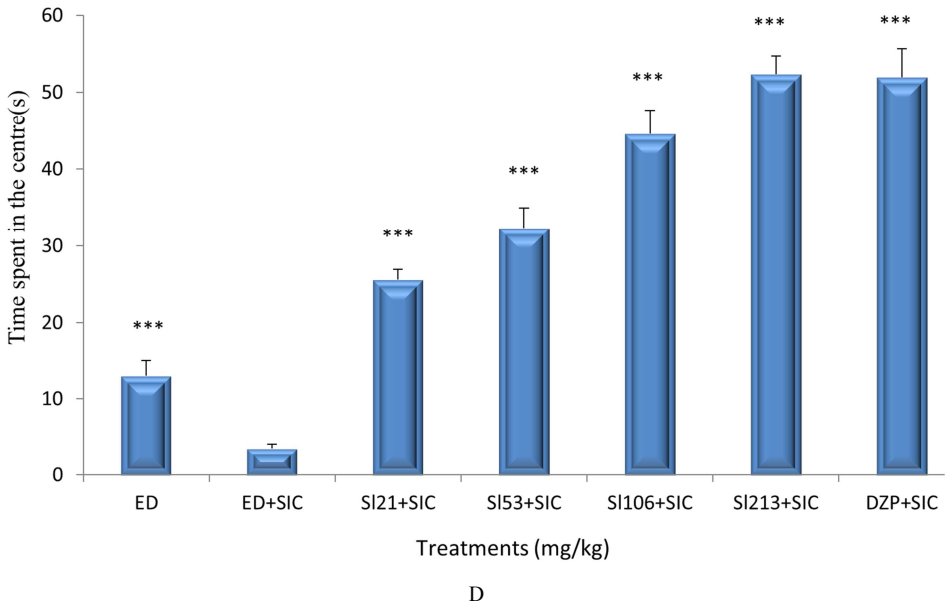
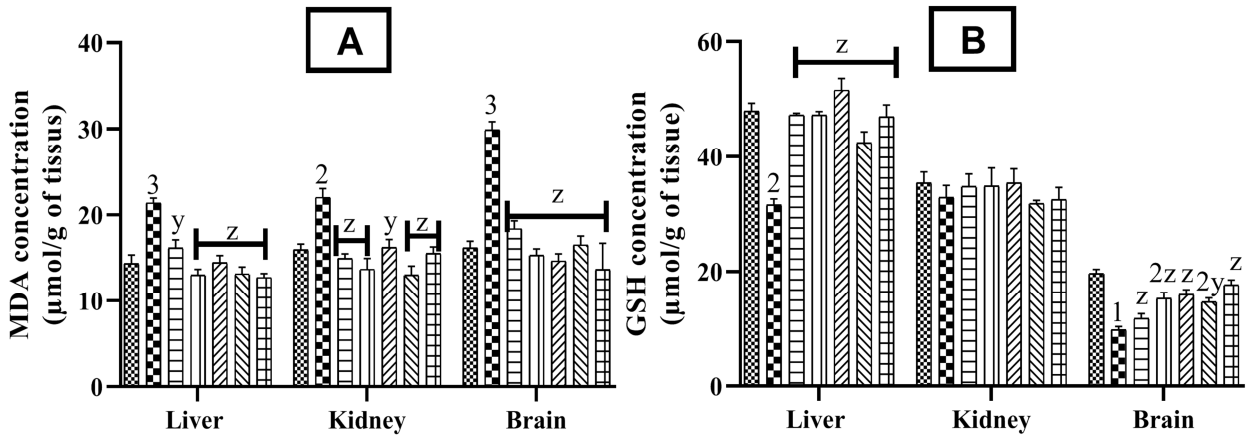


Figure 6. *Anxiolytic properties of Securidaca longepedunculata decoction on the EPM and OF. A (on the number of entries in open arms); B (on the number of entries in closed arms); C (on the number of crossings); D (on the time spent in the centre). Each bar represents the parameters of the EPM or OF, n = 5. *p<0.05, ***p<0.001; significant difference from negative control; ED: distilled water; SL21, Sl53, Sl106, Sl213: different doses of Securidaca longepedunculata; DZP: Diazepam at 2 mg/kg.*

3.5. Anxiolitic and Antioxidant Properties of Securidaca longepedunculata Decoction in Vivo

The figure 7A shows the decoction effect of S. longepedunculata on the concentration of malondialdehyde (MDA) in the liver, kidney and brain. In these organs, there was a significant increase (p<0.001) of MDA concentration between the normal control and the stressed negative control. The *plant* decoction at 213 mg/kg dose induced a higher significant decrease (p<0.001) of MDA concentration compared to the stressed negative control group. Diazepam also induced a significant decrease (p<0.001) of this lipid concentration. The figure 7B shows the concentration of reduced glutathione (GSH) in the liver, kidney and brain. It was a significant decrease (p<0.001) of GSH concentration between the normal control and the stressed negative control. The *plant* decoction at 213 mg/kg dose induced a higher significant increase (p<0.001) of GSH concentration compared to the stressed negative control group. Diazepam also induced a significant increase (p<0.001) of this enzyme concentration. The figure 7C shows equally the concentration of catalase (CAT) in the liver, kidney and brain. It was a significant decrease (p<0.001) of CAT concentration between the normal control and the stressed negative control. The *plant* decoction at 213 mg/kg dose induced a higher significant increase (p<0.001) of CAT concentration compared to the stressed negative control group. Diazepam also induced a significant increase (p<0.001) of this emzyme concentration. The figure 7D shows also the concentration of superoxyde dismutase (SOD) in the following organs like liver, kidney and brain. It was a significant decrease (p<0.001) of SOD concentration between the normal control and the stressed negative control. The *plant* decoction at 213 mg/kg dose induced a higher significant increase (p<0.001) of SOD concentration compared to the stressed negative control group. Diazepam also induced a significant increase (p<0.001) of SOD concentration.



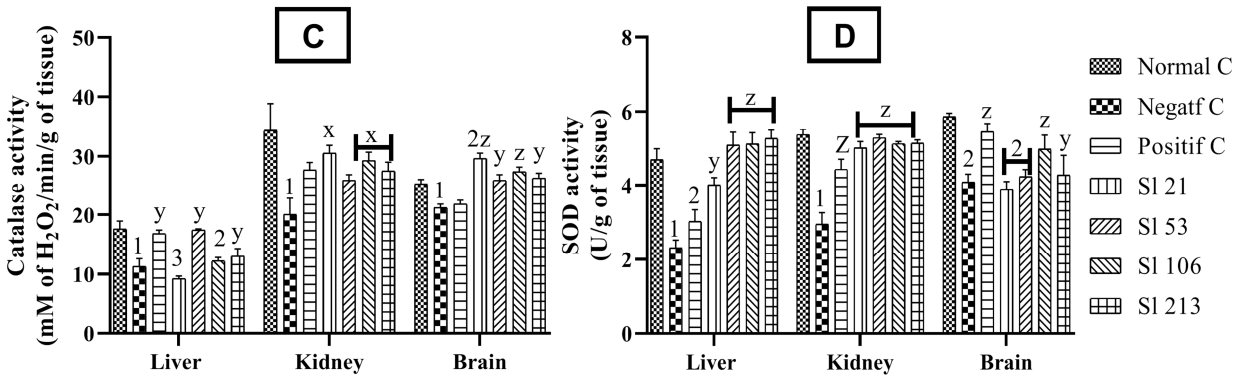


Figure 7. *Anxiolytic and antioxidant Effects of Securidaca longepedunculata decoction in vivo. A (on the concentration of Malonaldehyde), B (on the concentration of reduced glutathione); C (on the concentration of catalase); D (on the concentration of Superoxyde dismutase); Each bar represents the parameters of the EPM or OF, n = 5. 1p<0,05; 2p<0,01; 3p<0,0001; significant difference from negative control; ED: distilled water; Sl21, Sl53, Sl10, Sls213: different doses of Securidaca longepedunculata; DZP: Diazepam at 5 mg/kg.*

4. Discussion

The EPM test is based on the study of the spontaneous behaviour of animals on the anxiety paradigm. In this study, the figure 3 shows a higher significant increase of the number of entries and time spent in the open arms, the percentages of entries in the open arms on the EPM and a decrease of the time spent in the closed arms their percentages in the closed arms on the other [16]. From these results, it was deduced that the decoction of *S. longepedunculata* would have anxiolytic properties because substances that increase the number of entries and time spent in the open arms have been shown to have anxiolytic effects. These results suggest that the plant extract like the diazepam would have anxiolytics properties. This aqueous extract would act through to the complex GAbA-A receptor at the level of barbiturates receptor sites, benzodiazepine, alcohol, thiroidian or gaba sites too, by extending the opening of voltage-dependent chloride channel to produce the anxiolytic effect [16, 17]. The results obtained in the open field test showed a significant increase of the number of crossings, the time spent in the centre of mice treated with *S. longepedunculata* extract. So, these parameters indicate the increase of locomotor activity and the level of exploration in rodents, this is an intrinsic manifestation of the reduction of anxiety [17, 18]. Our results suggest that the decoction of *S. longepedunculata* could contain compounds that possess anxiolytic properties. This anxiolysis would take place by acting on the benzodiazepine site contained in GABA receptors [18]. Because the *S. longepedunculata* roots revealed the presence of certain compounds in the plant extract as phenolic, flavonoids, sterols, saponosides and triterpènes. The parameters evaluated through the results obtained from the hole board test showed that like diazepam, the decoction of *S. longepedunculata* caused a reduction of the latency time of the first head dipping, the number of head dipping. These results corroborate with these of Hellion-Ibarrola and co-workers in 2006 on the extract of Aloysia polystachya (Griseb.) Moldenke (Verbanaceae) who showed that these extracts possess anxiolytic effects by reducing the number of explorations of the holes in the board [18, 19]. As the diazepam, the extract of our plant would act on the GABA-A receptor complex, precisely at his different receptor sites for reducing the opening time of the voltage-dependent chloride channel. The chronic immobilization stress test on the elevated plus maze paradigm showed that the number of entries of the open arms in the groups witch treated with SIC and different doses of the plant decoction were increased board [20, 21]. These parameters were also high in mice from the group that received diazepam and CIS. In contrast, the number of entries of the closed arms were reduced significantly from the normal control (ED) to the negative control (ED+SIC) group. These results show that the decoction of *S. longepeduncula* would have anxiolytic effects [21-23].. It has been shown that substances that increase the number of entries and the time spent in the open arms have anxiolytic effects [23, 24]. This increase in the number of entries and the time spent in the centre of the elevated plus maze or open field shows the animal's desire to explore its environment and the more time the animal spents in the open arms. The increase of these parameters may reflect the fact that the animal feels comfortable and is not afraid to walk the EPM. These results indicate also that the *S. longepedunculata* decoction would possess anxiolytic properties which could be explained through some assumptions giving details about the mechanism of action. In this test, chronic immobilisation would stimulate may be the hypothalamic-pituitary-adrenal (HPA) axis through the production of biogenic amines (catecholamine). These amines favor the release of glucocorticoids, responsible for the anxiety [24, 25].]. This anxiolytic effect could equally be explained by a possible action of the plant decoction on the GABAergic way through the GABA-A receptor. This plant decoction would have been active by influencing the benzodiazepine or barbiturate sites [25, 26]. Concerning in vivo antioxidant analysis, the results showed that, the decoction of our plant has an activity on the antioxidant parameters at the brain, liver and kidneys level. There is a significant enhance of the activity of SOD, CAT and GSH which are enzymes responsible for antioxidant activity. Conversly, there is the significant reduction of the activity of

MDA, lipid observed in all the mice of the groups treated with different doses of *S. longepedunculata* decoction as well as in those treated with diazepam [25, 26]. these results show that the decoction of the plant proceeds too through the antioxidant enzyme pathway to reduce free radicals and thus treat anxiety. As the treatment of chronic anxiety has been demonstrated, the plant would have a concret efficacy with visible behavioural effects and stable enzymatic and neurochemical markers [26, 27].

5. Conclusion

At the end of our study which consisted for evaluating the anxiolytic activity of the decoction of roots of Securidaca longepedunculata, it appears that, the test of acute toxicity of the decoction administered to the single dose to the animal populations allowed us to determine the LD50 which is higher than 5000 mg/kg of body weight, indicating that the decoction is almost very few toxic. The phytochemical screening revealed the presence of flavonoids, saponosides, sterols, triterpenes and phenolic compounds able to participate in action mecanism. The decoction of the plant was found to possess anxiolytic activity on basic and chronic anxiety that was induced through classical and restrictor paradigms. This could be observed by the fact that the results obtained on the different devices such as the EPM, the OF and the HB show that the decoction of the plant significantly increased some classical behavioural parameters of anxiety in mice that received the decoction of the plant. The assay of oxidative stress markers showed that antioxidant analysis organs like brain, liver or kidney had concentration of CAT, SOD, GPx and GSH increased. But their malondialdehyde was low. These parameters were improved by the plant extract at all doses, suggesting that this extract would have antioxidant properties. That is why *Securidaca longepedunculata* is frequently used and very appreciated in African medicine.

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