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## Preliminary phytochemical screening of *Parkinsonia aculeata* Leaf extracts

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### Abstract

*Parkinsonia aculeata* is a small tree that can be found in the northern part of Nigeria. Its leaves are locally used to treat diarrhea in some villages of Sokoto, however, there is little or no information on its phytochemical constituents. This paper therefore, reports the findings on the preliminary phytochemical investigation on the leaf extracts. The result indicates the presence of alkanoids, flavonoids, cardiac glycosides, glycosides and steroids in all the three extracts analyzed. Tannins, saponins and saponin glycosides are present in aqueous and methanolic extracts but not in petroleum ether fraction, while both anthraquinone and anthraquinone glycosides are absent in the entire three fractions. This may be attributed to the polarity of the solvents. The presence of some of these bioactive compounds justifies the usage of the plant for traditional medicine.

**Keywords:** *Parkinsonia aculeata*, phytochemical, traditional medicine

### Introduction

Medicinal plants are of great importance in treating many ailments and diseases traditionally. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on human body. These chemical substances are termed phytochemicals. The most important of these plant chemicals are alkaloids, tannins, flavonoids and phenolic compounds. About 60-70% of world population relies on plant based medicines (Dhawale, 2013) [3] especially in Africa and Asia. The significance of plants in traditional medicine and the importance of the distribution of these chemical constituents in ethnomedicine in our country Nigeria cannot be over emphasized.

Phytochemistry is the subject that is concerned with variety of organic substances present in plants, their biosynthesis and metabolism, natural distribution and their microbiological functions. It essentially entails the separation, identification, purification and quantification of the different phytoconstituents (Harbone, 1973) [6]. Phytochemicals are the natural bioactive compounds found in plants. They work with nutrients and fibres to form an integrated part of defense system against various diseases and stress conditions (Dhawale, 2013) [3]. These natural compounds formed the base of modern drugs as we use today (Edegoa *et al.*, 2005) [4]. They are believed to be the source of pharmacologically active substances and are known to produce certain chemicals that are naturally toxic to microbes (Yusha'u *et al.*, 2009) [17].

*Parkinsonia aculeata* belongs to the family fabaceae (pea family). It is a small spiny tree 4-10cm high. The leaves are specialized, alternate, bipinnate and consist of very short axis ending in spine 1-2cm long. The tree profusely produces seeds and grows easily from seed. It is being used as food. The edible fruit pulp is sweet up to 60% sugar (Orwa *et al.*, 2009) [11]. The plant is locally called "Sharannabi" or Sasabani in Hausa. Its leaves are used locally to treat diarrhea in some villages of Sokoto, northern part of Nigeria. The plant was also reported to have antimicrobial property. However, there is little or no information about the phytoconstituents of the plant parts. Therefore, this research work is aimed at investigating the preliminary phytoconstituents of the plant leaves in order to justify the traditional usage locally.

### Materials and Methods

#### (a) Sample Collection and Preparation

The leaves of *Parkinsonia aculeata* were obtained from Kwalkwalawa area around Usmanu Danfodiyo University, Sokoto northern part of Nigeria.

The plant was identified at the botany unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto. The leaves were dried at room temperature for seven days and pulverized to moderately coarse powder using clean laboratory mortar and pestle.

### (b) Phytochemical Screening

Chemical tests were carried out on the aqueous, methanolic and petroleum ether extracts using standard methods.

### (c) Extraction

Aqueous extract was obtained by dissolving 20g of the powdered plant leaves in 500cm<sup>3</sup> beakers with distilled water and allowed to stand at room temperature for 24hrs. It was filtered, the filtrate was oven dried at 50 °C and then used for phytochemical analysis.

Methanol extract was obtained by continuous extraction of 20g of the powdered sample in soxhlet extractor using methanol as solvent. The sample procedure was repeated with petroleum ether as solvent to obtain the petroleum ether extracts. Both extracts were concentrated on electrically heated water bath.

### Test for alkaloids

1cm<sup>3</sup> of 1% HCl was added to 3cm<sup>3</sup> each of the aqueous, methanol and petroleum ether extracts in a test tube. The mixture was heated for 20minutes. It was cooled and filtered; the filtrate was used for alkaloids test.

- (i) 2 drops of Wagners reagent (1.3g of iodine crystal and potassium iodide in 5cm<sup>3</sup> distilled water volume made up to 100cm<sup>3</sup>) was added to 1cm<sup>3</sup> each of the extracts. A reddish brown precipitate observed indicate the presence of alkaloids.
- (ii) 2 drops of Mayers reagent (1.5g of mercuric chloride and 5g of potassium iodide in distilled water, volume made up to 100cm<sup>3</sup>) was added to 1cm<sup>3</sup> each of the extracts. A creamy precipitate observed indicate the presence of alkaloids.
- (iii) 2 drops of tannic acid was added to 1cm<sup>3</sup> each of the extracts separately in a test tube. A creamy precipitate observed indicate the presence of alkaloids in all the extracts. (Isaac and Chinwe, 2001) [8].

### Test for Saponins

- (i) Frothing test - 2cm<sup>3</sup> of the extract each in a separate test tube were vigorously shaken for 2minutes. Persisting frothing observed in each extract tested indicates the presence of saponins.
- (ii) Emulsion test - 5 drops of Olive oil was added to 3cm<sup>3</sup> of the extracts each in a test tube and the mixtures were vigorously shaken. A stable emulsion formed in each extract tested indicates the presence of saponins. (Treese and Evans, 1989; Sofowara, 1993) [15, 14].

### Test for Tannins

- (i) 1cm<sup>3</sup> of freshly prepared 10% KOH was added to 1cm<sup>3</sup> of the extracts. A dirty white precipitate observed indicates the presence of tannins.
- (ii) 2 drops of 5% FeCl<sub>3</sub> was added to 1cm<sup>3</sup> of the extracts. A greenish precipitate observed indicates the presence of tannins (Isaac and Chinwe, 2001) [8].

### Test for glycosides

10cm<sup>3</sup> of 50% H<sub>2</sub>SO<sub>4</sub> was added to 1cm<sup>3</sup> of the extracts each test tube. The mixture was heated in boiling water for

15minutes. 10cm<sup>3</sup> of fehling's solution were added to each test tube and mixture boiled. A brick red precipitate observed indicates the presence of glycosides (Isaac and Chinwe, 2001) [8].

### Test for Saponin glycosides

2.5cm<sup>3</sup> of fehling's solution A and B were added to 2.5cm<sup>3</sup> each of the extract and the mixture was shaken. A bluish-green precipitate indicate the presence of saponin-glycoside (Harbone, 1973) [6].

### Test for Cardiac Glycosides

Keller-killian test: To 1cm<sup>3</sup> each of the extracts, 2cm<sup>3</sup> of 3.5% ferric chloride solution were added and allowed to stand for 1minute. 1cm<sup>3</sup> of concentrated H<sub>2</sub>SO<sub>4</sub> was carefully poured down the wall of the test tube each, the lower layer changed from green to blue indicating the presence of cardiac glycosides (Harbone, 1973) [6].

### Test for Flavonoids

1cm<sup>3</sup> of 10% NaOH was added to 3cm<sup>3</sup> each of the extracts. A yellow colouration observed in the extracts tested indicates the presence of flavonoids (Isaac and Chinwe, 2001) [8].

### Test for Steroids

The extracts were treated with equal amount of concentrated H<sub>2</sub>SO<sub>4</sub> and acetic acid anhydride. A change in colour from green to pink to purple to violet indicates the presence of steroids (Harbone, 1973) [6].

### Test for free Anthraquinones

5g each of the extracts was shaken with 10cm<sup>3</sup> benzene and filtered. 5cm<sup>3</sup> of 10% ammonia solution was added to the filtrate. The mixture was shaken and the presence of pink, red or violet colour in the ammonia layer (lower phase) indicates the presence of free anthraquinones (Harbone, 1973) [6].

### Test for Anthraquinone glycosides

0.5g of the extract was boiled with 10cm<sup>3</sup> dilute H<sub>2</sub>SO<sub>4</sub> for 2 minutes. This will hydrolyze the glycosides to yield a glycones which are soluble in hot but not in cold water. The hot solution was filtered and the filtrate was cooled, and then extracted by gentle shaking with 5cm<sup>3</sup> benzene. The upper benzene layer (yellow) was separated with a pipette and was shaken vigorously with a small amount (2-3cm<sup>3</sup>) of 10% ammonia. The lower ammonia layer turn rose pink to cherry red immediately or on standing. This indicates the presence of anthraquinone glycosides (Harbone, 1973) [6].

## Results and Discussion

The results of the phytochemical analysis of *Parkinsonia aculeata* leaves extracts are shown in the table below;

**Table 1:** Results of Phytochemical Analysis of *Parkinsonia aculeata* leaves extracts

| Phytochemical            | Extracts |          |                 |
|--------------------------|----------|----------|-----------------|
|                          | Aqueous  | Methanol | Petroleum ether |
| Alkaloids                | +        | +        | +               |
| Tannins                  | +        | +        | -               |
| Flavonoids               | +        | +        | +               |
| Cardiac glycoside        | +        | +        | +               |
| Saponins                 | +        | +        | -               |
| Saponin glycoside        | +        | +        | -               |
| Glycoside                | +        | +        | +               |
| Steroid                  | +        | +        | +               |
| Anthraquinone            | -        | -        | -               |
| Anthraquinone -glycoside | -        | -        | -               |

The result indicates the presence of alkaloids, flavonoids, cardiac glycosides, glycosides and steroids in all the three extracts. Tannins, saponins and saponin glycosides are present in aqueous and methanolic extracts but not in petroleum ether fraction, while both anthraquinones and anthraquinone glycosides are absent in all the three extracts. This may be attributed to the polarity of the solvents. The presence of phytochemicals had earlier been reported in other plants of medicinal importance (Yahaya *et al.*, 2016) [16]. The presence of these phytochemicals in the leaves of *Parkinsonia aculeata* as reported in this research has therefore further confirms its therapeutic application traditionally. Pharmaceutical and therapeutic values of plants and their products lie on the presence of these phytochemicals (Edeoga *et al.*, 2005) [4].

Alkaloids are known to play some metabolic role and control development in living organism. They have anti-malaria, anti-inflammatory, and anti-microbial effect (Justin *et al.*, 2014) [9]. Tannins are associated with many human physiological activities such as stimulation of phagocytic cells and hos-mediated tumor activity and a wide range of infective actions (Haslam, 1996) [7]. Flavonoids were reported to be responsible for antimicrobial activity associated with some ethnomedicinal plants (Singh and Bhat, 2003) [13]. They have anti-allergic, anti-inflammatory, anti-bacterial, anti-cancer, anti-diarrhea and anti-oxidant properties (Cushine, 2011) [2]. In addition anthocyanins a class of flavonoids from *Guiera senegalensis* were also reported to have anti-oxidant property against tissue damage that may be caused by toxic chemicals and/or natural processes in the body that may generate free radicals (Mohammed and Sule, 2009) [10].

Saponins are used as expectorant and emulsifying agent (Edeoga *et al.*, 2005) [4]. Glycosides play important roles in living organisms. They are used as medication for the treatment of congestive heart failure and cardiac arrhythmia (Yahaya *et al.*, 2006) [16]. Steroids are implicated in the reduction of risks of coronary heart and neurodegenerative diseases in healthy and young postmenopausal women (Perrella *et al.*, 2003) [12].

The anti-microbial properties of plant extracts are believed to be due to the presence of phytoconstituents (Bodeker, 1994) [1]. The biological and pharmacological properties of phytochemicals are usually attributed to their free radical scavenging efficacies, metal complexation capabilities and their ability to bind to proteins with a high degree of specificity (Fotie, 2005) [4].

### Conclusion

*Parkinsonia aculeata* is implicated in traditional medicine in northern part of Nigeria and there is little or no information about the phytochemical constituents of the plant parts. However, phytochemical analysis of its leaves extracts revealed the presence of some bioactive compounds which are believed to be the reason for its potency.

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