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Phytochemical screening of *Dierama cupuliflorum* Klatt. (Iridaceae)

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ABSTRACT

Background: Plants continue to play a vital role in their therapeutic value. This is because of the vast secondary metabolites that many of them produce. These natural products have been utilised as single or in combination with other compounds for utilization as source of drugs for many ailments in form of antibacterials, antifungals, antivirals, antihelminthes, and antimalarials among others. Plants evaluated phytochemically in most cases have previous reports on biological activity, ethnomedicinal or traditional medicine usage. However, many other plants with no such previous reports may be as important with variety of natural products with potential significance in pharmaceuticals for drug development. *Dierama cupuliflorum* is one such plant. The aim of the present study was to investigate the presence of phytochemicals in this plant. **Method** : The organic solvent extracts from Methanol: Dichloromethane (1:1) along with dry powder/ground portions from corms and aerial parts were screened for the presence of selected phytochemicals using standard chemical procedures. **Results**: Phytochemical screening revealed the presence of terpenoids, alkaloids, saponins, tannins, flavanoids, glycosides and anthraquinones. More phytochemicals were detected in corms than in the aerial parts. **Conclusion**: Although there is no available report on the use of this plant for medicinal purposes, the phytochemical data presented here has demonstrated that this plant has the potential to be used significantly for therapeutic purposes in many health challenges. This study has therefore laid down a good foundation for future studies on this plant whose bioactivity studies are currently underway.

Key words: Dierama, Phytochemicals, drug discovery.

1. INTRODUCTION

Plants have been used as medicine for centuries to manage various illnesses. To date, even with the development and growth in conventional medicine, a majority of our population still rely on medicinal plants as the answer to their health problems. Biological research has proved that indeed plants posses various secondary metabolites, many of which are bioactive against various pathogens while others have disease preventive properties .Still others are important in food preservation, as alternative medicine and natural therapies[1,2] . some compounds derived from plants that have been used as drugs either in their original form or semi-synthetic form to manage various ailments include ephedrine (bronchodilator), colchicines (antigout), morphine (analgesic) , and artemisinin (antimalarial) among others[3,4] .

Natural products continue to play a crucial role in drug development as they account for almost 50% new chemical entities in drug discovery and hence provide a starting point for new synthetic compounds ; in addition to this, they may also be used as templates for synthetic modification in drug discovery and developmemt. Infact natural products are source to about 90% of newly discovered pharmaceuiticals in use[4,5,6]. For many years, extensive research has been dedicated at discovering novel natural products with pharmaceuticals significance, however amongst approximately 500,000 plants species occurring world wide, only 1% have been phytochemically screened while amongst about 250,000 existing higher plants, only about 15 % have been evaluated phytochemically[2,7,8,9,10]. A lot therefore still needs to be done, more so on plants with no or scanty previous reports on ethnomedicinal usage . This is in order to unearth novel bioactive compounds for utilization as potential sources of drugs . This study was conducted to contribute towards this goal. Genus *Dierama* K. Koch belongs to the family iridaceae . it is an evergreen perennial herbs with corms which posses coarsely fibrous tunics. Leaves are several with the lower ones sheathing the stem base. Stem slender with usually branched inflorescence consisting of spikes in a lax panicle; spikes few to many , erect or pendulous. Flowers range from pink, red, purple , yellow and whiten in colour [11]. It is composed of 44 species distributed within South Africa, Tropical Africa and Ethiopia[12,13]. In parts of the world where they are found they are mainly used as ornamental flowers in gardens with other ornamental grasses[14]. The only species found in Kenya *Dierama cupuliflorum* grows as a wild flower in highland areas with no commercial utilization reported.

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Dierama cupuliflorum Klatt, is a tufted perennial herb with large panicles of delicate blue or purple flowers hanging on long thin stalks. They are common in undisturbed high altitude grassland with altitude of about 2400-3900m. Mount Elgon, Cherenganyi hills, Mau, Abardares- through Wandare route towards Satima , Karuru river and Njambini, Mount Kenya [11].

Literature search revealed no reports on the ethnomedicinal usage and biological assays. Similarly no work has been done on the phytochemical screening of this plant.

This article presents the phytochemical investigations conducted on this plant for the first time.

2. MATERIALS AND METHODS

2.1 Collection and identification of plant material

Dierama cupuliflorum was collected from Aberdares National park , through Wandare route towards Satima in the year 2011and identified by a plant taxonomist at the school of biological sciences, University of Nairobi.

2.2 Processing of the plant material to obtain crude extracts

The plants were cut into aerials and corms, which were both shredded into pieces to fasten drying under shade at room temperature. The dried plant materials were then ground into powder and kept awaiting extraction by organic solvents and phytochemical screening.

30g of powdered plant material was extracted using dichloromethane : methanol in the ratio 1:1 , the mixture was filtered using whatman filter paper No. 1. The filtrate was subjected to a rotary evaporation to obtain dry crude extracts. These were kept in the refrigerator at 4ºC awaiting phytochemical screening.

3. Qualitative phytochemical analysis

Chemical tests were conducted on organic solvent extracts and powdered plant materials of both aerial and corm parts following standard chemical procedures according to[15,16,17]. The phytochemicals analysed were alkaloids, flavanoids, saponins, tannins, glycosides, steroids, anthraquinones and terpenoids.

3.1 Screening procedure

3.1.1 Test for saponins

5ml of distilled water was added to 0.5g of powdered plant material in a vial . The mixture was shaken and heated in water bath for 2min. The presence of a stable froth indicated the presence of saponins.

3.1.2 Test for steroids

Two methods were used to determine the presence of steroids in the plant extracts. I) 0.5g of powdered plant material was mixed with 2ml acetic anhydride in a boiling tube and then cooled in ice for five minutes , 2ml concentrated sulphuric acid was added slowly along the wall of the test tube. Colour change from violet , to blue , to green was an indicative of the presence of steroids. II) concentrated sulphuric acid was slowly added to 2g of plant extract . Effervescence followed by appearance of a clear reddish brown colour at the interface was an indication of a steroidal ring.

3.1.3 Test for tannins

10 ml distilled water was added to 0.5g of powdered plant material in a test tube. The was boiled for 3min and filtered using Whatman filter paper No. 1. Ferric chloride was added and the mixture observed for dark or dirty green precipitate which indicated the presence of tannins.

3.1.4 Test for terpenoids

0.5g of powdered plant material was added in a boiling tube and 2ml chloroform carefully added, 3ml concentrated sulphuric acid was added drop wise. Presence of a reddish brown colouration at the interface showed positive results for the presence of terpenoids.

3.1.5 Test for glycosides

0.5 g of the ground plant material was added to a boiling tube. 10ml distilled water was added and stirred. This was filtered and 2ml of the filtrate hydrolyzed with few drops of concentrated hydrochloric acid. a few drops of ammonia solution was added to the mixture . Five drops of this solution was put a side in a separate test tube and 2ml of benedicts reagent added and boiled. Reddish to brown precipitate was an indicative of the presence of glycosides.

3.1.6 Test for flavonoids

0.5 g of the extract was heated with 10ml ethyl acetate over a steam bath for 3 min, the mixture was filtered and 4ml of the filtrate was shaken with 1ml dilute ammonia (50%). presence of a yellow colouration indicated the presence of flavonoids.

3.1.7 Test for alkaloids

0.5g of the powdered plants parts was added into a boiling tube . 5ml of 2% sulphuric acid was added, mixed and filtered . Few drops of Drangedorff´s reagent was added to the filtrate. Presence of an orange red precipitate indicated the presence of alkaloids.

3.1.8 Test for anthraquinones

1g of powdered plant material added into a boiling tube and boiled with 2ml of 10% hydrochloric acid for 5min. The mixture was filtered and the filtrate cooled.The filtrate was partitioned against equal volume of chloroform and the chloroform layer transferred into a clean test tube . Equal volume of volume of 10% ammonia solution was added into the chloroform layer, shaken and allowed to separate. The separated aqueuos layer was observed for a delicate rose pink colour which showed the presence of anthraquinones.

4. RESULTS AND DISCUSSION

The results of phytochemical screening of the aerials and corms of *D. cupuliflorum* showed presence of various classes of compounds in the plant. The observations were recorded depending on the colour change intensity as strongly present, moderately present, weakly

present or Not detected as in Table 1. Corms appeared to be rich in various phytochemicals as compared to the aerial portions. Steroids were not detected in this plant. All the tested phytochemicals were strongly present in the corms except anthraquionones which showed moderate presence.

The aerial portion showed strong presence of flavonoids, saponins, and tannins ; glycosides were moderately present while alkaloids, terpenoids, and anthraquinones were weakly present (Table 1).

Table 1: Phytochemical constituents from corms and aerial/ leaves parts of *Dierama cupuliflorum*

Phytochemicals	Corm	Aerial /leaves
Flavonoids	+++	+++
Saponins	+++	+++
Alkaloids	+++	+
Terpenoids	+++	+
Steroids	-	-
Tannins	+++	+++
Glycosides	+++	++
Anthraquinones	++	+

Key :
+++ = Strongly present
++= Moderately present
+ = Weakly present
- = Not detected

The presence of the phytochemicals may be of anti-infective and therapeutic significance because, the value of plants with medicinal activities lies in the natural products or chemical substances present that exert numerous biological activities in the body[7,15].

Alkaloids, a group of compounds with basic nitrogen atoms in their chemical structure are widely present in root barks, rhizomes or corms and are characterized by a bitter taste. They posses antimalarial, antibacterial, antifungal, and some have been investigated to have anticancer properties[18,19,20].

Polyphenol compounds such as flavonoids and tannins are characterized by presence of multiple phenol groups. They have avast range of pharmacological significance such as antioxidant property used for cancer management among other health complications. Their ability to scavenge for free radicals makes them have chemopreventive property[19]. Flavonoids have also been reported to have broad antimicrobial, antimalarial, anti-allergic, anti-inflammatory, hepatoprotective, anti-tumor, anti-viral, enzyme inhibition and anti-thrombotic activities while tannins are significant as anti-hemmorhoidals, hemostatic antimicrobials and also used in preparations of anti-diarhoeals[18,1,21]. Saponins, mostly found in plant skins are vital in their ability to lower cholesterol levels. They also have antioxidant, anti-inflamatory antimalarial properties.Saponins are also used in industries to to clean industrial equipments and fabrics. Terpenoids, a diverse class of organic chemicals have been reported to have antimicrobial - antibacterial activities and wound healing ability by strengthening the skin and increasing the level of antioxidants in the wounds. They also restore inflamed tissues by improving the blood supply[18,1,15,21]. In a report by [17], presence of glycosides were speculated to have anti-HIV-1 protease inhibitory activity.

5. CONCLUSION

This present study has revealed that *Dierama cupuliflorum* has a wide range of classes of compounds which have potential significance in Pharmaceuticals as source of chemotherapeutics and anti-infectives against a wide range of pathogens.

Inorder to consider therapeutic and anti-infective significance of these phytochemicals, different biological activity studies including cytotoxicity are currently underway.

Conflict of interest

All authors have none to declare.

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