IJASRM
International Journal of Advanced Scientific Research and Management, Volume 4 Issue 6, June 2019
www.ijasrm.com
ISSN 2455-6378

Pharmacognostic Studies and Anti-Microbial Assay of Aqueous Floral extracts of *Kigelia africana* (Lam.) Benth.

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Abstract

Flowers are the reproductive portions of any plant belonging to division Mangnoliophyta (Angiospermae). There is an endless combination of colors seen in light and dark phase during the 24 hours duration making them one of the most remarkable features of a plant. *Kigelia africana* flowers are potent to have antimicrobial properties as it has been a part of the diet to many omnivorous animals. Analyzing the antimicrobial effect it was observed that the aqueous extracts of the flower prepared in the ratio of (1mg/1ml) showed considerable bacterial growth inhibition as compared to the fungal growth. All the three bacterial strains *Staphylococcus aureus, Klebsiella pneumonia* and *Pseudomonas stutzeri* showed the zone of inhibition ranging from 10 to 13mm. Among the fungi used to study the antifungal properties of the extracts were *Penicillium citrium, Aspergillus niger* and *Candida albicans*, out of which the extract showed an inhibitory effect only for *Aspergillus niger*.

Keywords: *Kigelia africana, flowers, Aqueous extracts, Pharmacognostic study, Antimicrobial activity.*

1. Introduction

Herbal drugs denote the transformation of plant part/parts into phyto-pharmacological substance resource leading to herbalism. Various ethno-medicinal historical records have been obtained showing importance and the capability of verdant towards cure to an ailment. Every plant family can be differentiated based on the floral similarities. Sir Joseph Dalton Hooker and George Bentham classified all the angiosperms based on the floral characters, a wave of change blew when such easy, clear set of classifying plants on their external characters. Flowers are the highly noted plant part, hence study on these important plant parts causes a curiosity to discover the probable competence in the drug industry with respect to the ethnic beliefs and usages. There is a huge list of angiosperms flowers that has been excluded from scientific studies due to various undisclosed reasons. The increasing use of plant extracts in the food, cosmetic, and pharmacological industries suggests that in order to extract active compounds, a systematic study of medicinal plants is very important (Abdulkadiri *et al*., 2015).

Bignoniaceae is the trumpet creeper or catalpa family with 110 genera and more than about 800 species of trees, shrubs and lianas. The members of this family constitute the tropical forest in the Indo-Malayan region. Plants predominantly have compound leaves, zygomorphic flowers, paired anthers, numerous ovules, silique like woody fruit capsules as well as winged and non endospermic seeds. The ethno medicinal scientific review shows that even though it is a small family yet it is a repository to many pharmacologically bioactive molecules (Ancy and Archana, 2019). Bignoniaceae family is said to have a wide range of colored fragrant flowers with a unique arrangement of the floral organs and accessory structures. The earth harbors a rich source of medicinal plants having traditional pharmacological uses. One among those medicinal plants is *Kigelia africana* that has great potentials to become the herbal resource to the pharmaceutical industries and taking a step towards discovery of plant based active compounds (Ancy *et al*., 2019).

Kigelia africana is an ornamental tree belonging to Bignoniaceae widespread along the tropical Africa. It is can grow up to 20metres in height and flowers after six years of planting them to the soil (Pette, 2003; Ken, 2019; Glew *et al*., 2010). It's a fascinating site when the tree sets to bloom wherein the inflorescences hung down from the branches along a long flexible stalk which is 2-6m long. Flowers are produced in panicles, bell shaped and about 10cm wide with maroon color (Olufemi, 2014). Individual flowers are seen oriented horizontally along the stalk of the inflorescence (Fig.

1). Bats and sun birds are the pollinators and the strong sturdy flexible stalk provides them a foot hold (Lelobu, 2015; Olufemi, 2014; 13). These bilabilate flowers bloom at night releasing an unpleasant odor to which nocturnal visitors (bats) get attracted for consuming the nectar in the flowers (Ken, 2019; Lelobu, 2015; Christian W and Claßen-Bockhoff R, 2007). When larger animals are the pollinators there is a fixed distance between the floor and the roof that impedes the access (Christian W and Claßen-Bockhoff R, 2007). The present study deals with the present study aims to analyze the documented antimicrobial properties in *Kigelia arficana* plant by the using its flowers and the dried powder of the flowers were studied for observing the various floral tissues.

Fig. 1: Kigelia africana inflorescence and flower (Retrived on 24th May 2019-https://kigeliashop.com/benefits-kigelia-africana-creme/; http://tropical.theferns.info/viewtropical.php?id=Kigelia+africana)

2. Materials and Methods

2.1 Sample collection

The plant sample (Inflorescence) where collected from the Gujarat University campus during the month of December. The flowers where separated from the inflorescence axis and washed in tap water and later in distil water and kept to dry at room temperature till the moisture content from the flowers was removed properly. The dried flowers of Kigelia were powdered and stored in clean dry vials in a clean place.

2.2 Pharmacognostic study

The powder was studied under the microscope to discover the different types of tissues that were present in them after drying. The powder was placed on a clean slide onto it a few drops of saffranin was added in order to stain the tissues contained in them underlying a cover slip and observed under a microscope. Photographs were taken of the peculiar structures seen under the 10X and 45X resolution of the simple microscope.

2.3 Extraction Procedure

10gms of dried flower powder was weighed using weighing balance and added to freshly prepared distil water in the ratio of (2:1). The solution was homogenised and properly sealed with an aluminium foil for 48hours in a clean place. After 2 days the solution was filtered using Whatmann filter paper No. 1. The filtration process takes some time since the extracts are aqueous. The obtained filtrate is then poured into pertiplates and left for drying at room temperature. After it gets dried a thick layer of dried extract could be seen on the petri plates to perform the antimicrobial assay.

2.4 Antimicrobial assay

The aqueous floral extracts of Kigelia flowers were tested against three bacterial strains (*Staphylococcus aureus, Klebsiella pneumonia and Pseudomonas stutzeri*) and three fungal strains (*Penicillium citrium, Aspergillus niger and Candida albicans*) by in vitro agar well diffusion method using standard protocol. The nutrient agar media for both fungi and bacteria was sterilized in an autoclave, and then it was poured in petri plates and allowed to get solidified; while for fungi the potato dextrose media was used. The agar plates were seeded with 100µl of bacteria as well as fungal inoculums. The wells were made of desired diameter using a cork borer and aqueous floral extracts (1mg/1ml) were poured inside the wells. The inoculums and the extract containing petriplates were incubated for 24hours while for the fungal strains it can range from 24 to 72 hours. The developing zones and their respective diameters were measured in millimetres. Minimum inhibition concentration of plant extracts to inhibit bacterial growth was determined by a micro-dilution method with the use of nutrient broth. The efficacy of the floral extracts were studied and optical densities where taken for of the broth series till there is decreasing optical density for the bacteria at 600nm.

3 Result and Discussion

3.1 Pharmacognostic study

Powder study is done in order to authenticate or identify the compounds in the given mixture individually. On performing the powder study of the flowers it was concluded that there are plant tissues like schlerenchyma, trachieds and trachea (vascular tissues) few starch grains, cubic Calcium oxalate crystals, trichomes and parenchymatous tissues. There have been no reports of the floral powders being studied as yet. Pharmacognostic studies are important as detection of adulterants becomes easy. Powdered drugs need to have a check of their

IJASRM
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ISSN 2455-6378

histological materials for authenticating a given plant powder (Wallis T E, 2005).

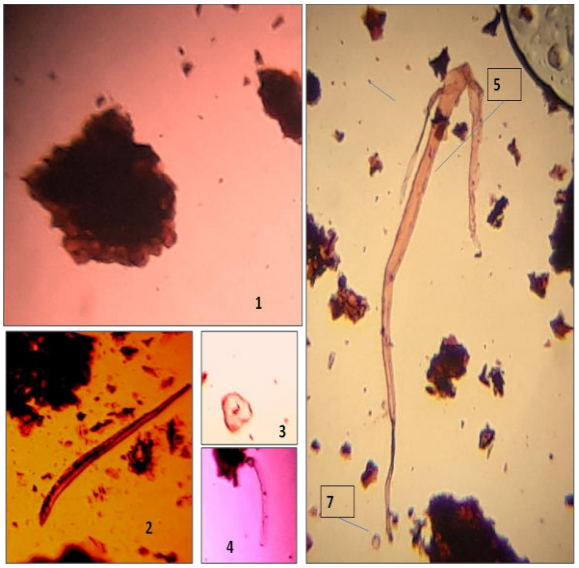

Fig. 2: Powder study of *Kigelia* flowers. (where,1.Sclerenchyma, 2.Tracheids, 3. Calcium oxalate crystals, 4. Hairs or trichomes).

3.2 Antimicrobial assay

The antimicrobial assay shows that the aqueous extracts of *Kigelia africana* flowers were efficient in control of bacteria to a greater extent as compared to the fungi. There have been no published reports on the antimicrobial properties of the flowers reported as yet. There has been some information that the ethnic people use the flower sap mixed with water as eye drops to cure eye sores (Ken, 2019). It has been noticed by some locals that the Impala consumed the flowers, there could be a possibility that when they had any kind of infections in their body they might be consuming them (Lelobu, 2015). This information can be linked with the results obtained stating that the bacteria growth inhibition is more efficient than the fungal inhibition by the aqueous extracts. The second probable reason could be the nectar from the flowers that provide the suitable medium for fungal growth henceforth revitalizing the flourished manner of fungal augmentation (Fig. 3 and 4). Based on the graphical representation of the average inhibition zone verses the microorganism it can be said that the zone of inhibition ranged from 10 to 13mm for bacteria while for the fungi only *Aspergilus niger* showed 16mm of inhibition zone (Fig. 4).

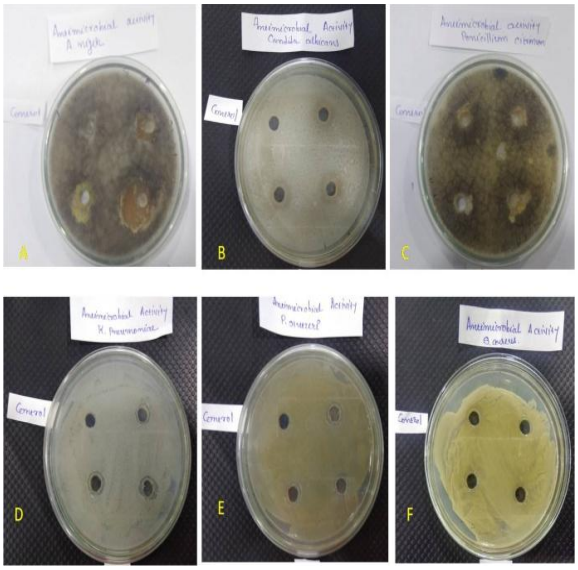

Fig. 3: Antimicrobial Activity shown by the Aqueous extracts of Kigelia africana flowers. (where, A-C represents the antifungal activity while Fig.1. D-F shows the antibacterial activity).

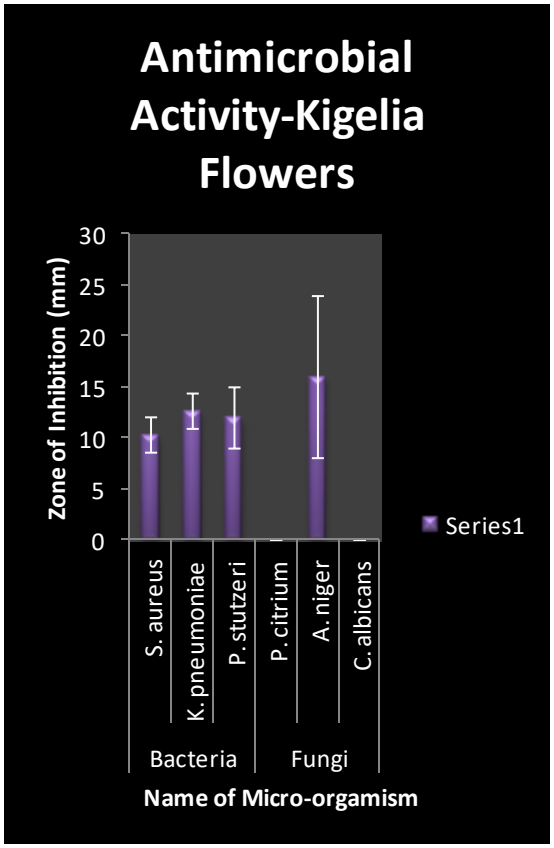

Fig. 4: Graphical representation of the zone of Inhibition (mm) showed due to the aqueous floral extracts of *Kigelia africana*.

Based on the graphical representation of the antimicrobial properties of the flowers of *Kigelia* it is evident that bacterial growth inhibition probability is higher than fungal growth inhibition (Fig. 4). The bacteria *K. pneumonia* and fungi *A. niger* when reviewed were found to be the causative agent that can cause pulmonary disorders in humans. It can be noted from Fig. 4 that bacteria *K. pneumonia* and fungi *A. niger* have the potentials to inhibit their growth. It has been found that the aqueous extracts are composed of secondary metabolites like Alkaloids, phenols, flavonoids, saponins and tannins that could be responsible for such micro-organism growth inhibiting agents. These metabolite groups are rich in various pharmacological properties enabling and supporting the folk usages of different parts of *Kigelia africana* (Ancy and Archana, 2019).

4. Conclusion

Kigelia africana flowers have been not yet being explored to the adequate extent in relation to its pharmacological efficacies. The obtained data from the present study and the review of the test microorganisms having capability of causing respiratory tract diseases to humans can be prevented using the floral extracts of *Kigelia*. It can be concluded that these aqueous extracts of flowers can be herbal cure towards various pulmonary diseases. This conclusion leads to a series of various kinds of clinical trials that could be done to affirm the potentials of the *Kigelia* flower. Later on, standardizing the aqueous floral extracts, isolation of the active phyto-component and incorporation of the plant based compounds in the herbal drug industries; a lot work is however to commence with relation to these findings.

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