

## Phytochemical and Antibacterial activity of leaf aqueous extract of *Tamarindusindica* L.

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### ABSTRACT

*Tamarindusindica*L. (Leguminosae) is a plant mostly found in West Africa including Nigeria. The plant is used for medicinal purposes in different parts of Nigeria. Phytochemical and Antibacterial activity of the aqueous extract of *T. indica* leaf extract was determined, phytochemical screening test have showed that, the leaf extract contains, Alkaloids, Glycosides, Tannins, Saponins and absence of Flavonoids. The leaf extract tested for the presence of secondary plant metabolites using standard procedures. It was further tested for antibacterial activity against clinical isolates of *Klebsiellapneumoniae*, *Escherichia coli*, *Pseudomonas aeroginos* causing disc diffusion and broth dilution techniques. Bioassay test results showed that *K. pneumoniae*, *E. coli* and *P. aeroginos* were sensitive to leaf aqueous extract of the plant with highest activity against *K. pneumoniae* (19mm) at 200mg/ml, *E. coli* (18mm) at 200mg/ml, *P. aeroginosa* (17mm) at 200mg/ml respectively. The plant extract was found to show inhibitory activity against the test isolates which may be related to the presence of phytoconstituents, some of which are reported to be responsible for antibacterial properties of medicinal plants. This may suggest that *T. indica* used in this study has potential against microbial infections.

**Keywords:** Antibacterial, *E. coli*, *K. pneumoniae*, *T. indica*, *P. aeroginosa*, phytochemical.

## INTRODUCTION

Plants have been exploited by many scientists for their medicinal purposes such as antimicrobial activity. The usage of plants as traditional remedies is the most common in Asia and Africa as reported to have minimal side effects (Bibitha *et al.*, 2002; Maghrani *et al.*, 2005). Recently, pharmaceutical industries spent a lot of money in developing natural products extracted from plants, to produce more cost effective remedies that are affordable to the population and curative for certain diseases. *Tamarindus indica* L. (Tamarind), *T. indicais* belonged to the family of *Fabaceae*, is a tropical evergreen tree native to fertile areas throughout Southern Asia and Africa. It is widely cultivated as an ornamental tree and for its acidic fruits used in marking drinks and a popular component of many decoctions used as health remedies. *T. indica* is used as a traditional medicine in India, Sudan, Nigeria and most of the tropical countries. *T. indicais* rich in nutrients and plays an important role in human nutrition, mainly in developing countries (Mohamed and Rangappa, 1992; Yanez *et al.*, 1995). It contains high level of crude protein with many essential amino acids, which help to build strong and efficient muscles. It is also high in carbohydrate content which provides energy and also rich in minerals such as potassium, phosphorus, calcium and magnesium. It can also provide smaller amount of iron and vitamin A. Phytochemical investigations have revealed the presence of many bioactive compounds such as phenolic compounds, cardiac glycosides (Rasue *et al.*, 1989), malic acid (Kobayashi *et al.*, 1996), mucilage, pectin arabinose, xylose, galactose, glucose and uronic acid (Ibrahim and Abbas, 1995; Coutino-Rodriguez *et al.*, 2001).

In Northern Nigerian, the fresh leaves, stem bark are used as decoction mixed with potash for treatment of stomach disorder, general body pain, jaundice, yellow fever and as blood tonic and skin cleanser. *T. indica* preparations are used as aid in restoration of sensation in cases of paralysis, reduction of body temperature in fevers and as laxatives, expectorant (Komutarinet *al.*, 2004).

The plant parts have been extensively studied in terms of pharmacological activity of its major compounds and results indicate potent antibacterial, antifungal, hypolipemic and antioxidant properties (Tsuda *et al.*, 1994; Martinello *et al.*, 2006), antihepatotoxic (Joyeux *et al.*, 1995), anti-inflammatory (Rimbau *et al.*, 1999), antimutagenic (Ramos *et al.*, 2003; Khanzada *et al.*, 2008) and antidiabetic (Maiti *et al.*, 2004) properties. *T. indica* fruit has been reported to have an additional beneficial effect on the mobilization of deposited fluoride from bone, by enhancing urinary excretion of fluoride (Khandare *et al.*, 2004). Because of the wide usage and availability, this study was designed to investigate the antimicrobial activity of leaf of the plant against some clinical isolates.

## **MATERIALS AND METHODS**

### **Collection of plant materials**

Fresh leaf sample of the plant was collected from Usmanu Danfodiyo University premises and was identified at the botany Unit herbarium of Biological Sciences Department of Usmanu Danfodiyo University, Sokoto. It was air dried and grounded into a powder using mortar and pestle separately in the laboratory in accordance with Mukhtar and Tukur (1999).

### **Extraction of plant material**

25g of the leaf of the plant was dissolved in 200ml of distilled water and kept to settle for 24 hours. It was later filtered using muslim cloth and dried in an dry oven. The residue was reconstituted for phytochemical screening tests (Harbone, 1998).

### **Phytochemical screening**

The extract was subjected to phytochemical tests after reconstitution with distilled water and concentrated to determine the secondary plant metabolites present in the plant material according to Aiki (1994), Oyeleka and Manga (2008).

### **Preparation of extract for antibacterial activity**

The sample of leaf of *T. indicaplant*; 1.25, 2.5, 3.75 and 5g were placed in a cleaned test tubes, 10ml of distilled water was added to give different concentrated (25, 50, 100 and 200mg/ml). The same concentrations were prepared using ciprofloxacin as a standard control.

### **Bacteria culture**

The test organisms were clinical isolates obtained from UsmanuDanfodiyoUniveristy Teaching hospital (UDUTH), Sokoto and subjected to biochemical tests again for re-identification (Cheesbrough, 2005; Oyeleka and Manga, 2008).

### **Antibacterial test**

The antibacterial tests of the plant extract was tested on the isolates suing disc diffusion method described by (NCCLS, 2008). The grams of the plant part leaf, 1.25, 2.5, 3.75 and 5g were dissolved in 10ml of distilled water to give the

concentrations of 25, 50, 100 and 200mg/ml respectively and autoclaved. Similar concentrations of standard control (ciprofloxacin) were prepared. Disc of variable concentrations of the prepared extract was incorporated into Mueller Hinton Agar medium and allowed to solidify. Sensitivity was determined by the absence of growth on or around the plate. The plates were incubated at 37°C for 24h before observation and the measurement of zones of inhibition.

## RESULTS

It is cleared from table 1, that *T. indica* leaf extract showed that, the plant contains the active ingredients tested such as alkaloids, tannins, glycosides, saponins and absence of flavonoids was also observed.

**Table 1: Phytochemical constitutes of leaf aqueous extract of *Tamarindusindica*L.**

| Alkaloids | Flavonoids | Glycosides | Tannins | Saponins |
|-----------|------------|------------|---------|----------|
| +         | ND         | +          | +       | +        |

**Key:** + = Presence

ND = Not detected

Table 2: Present the antibacterial activity of *T. indica*. Extract of *T. indica* shows strong effect on the growth of all the isolates tested at all concentrations, in a dose dependent. Manner with highest effect at 200mg/ml for organisms tested: *Escherichia coli*, *Pseudomonas aeruginosa* and *Klebsiellapneumoniaeas* indicated below.

**Table 2: Antibacterial activity of leaf aqueous extract of *Tamarindusindica* L.**

| Plant part/control | Conc. (mg/ml) | Zone of inhibition (mm) |                      |                      |
|--------------------|---------------|-------------------------|----------------------|----------------------|
|                    |               | <i>E. coli</i>          | <i>K. pneumoniae</i> | <i>P. aeruginosa</i> |
| Leaf               | 25            | 11                      | 10                   | 13                   |
|                    | 50            | 14                      | 12                   | 14                   |
|                    | 100           | 15                      | 17                   | 15                   |
|                    | 200           | 18                      | 19                   | 17                   |
|                    | 25            | 26                      | 28                   | 28                   |
| Ciprofloxacin      | 50            | 30                      | 29                   | 30                   |
|                    | 100           | 42                      | 28                   | 37                   |
|                    | 200           | 46                      | 33                   | 40                   |

**Key:** - = No inhibition  
 Value 1mm = Inhibition

## DISCUSSION

Phytochemical screening of *Tamarind* plant material indicated the presence of some secondary plant metabolites tested, such as alkaloids, tannins, glycosides, saponins and the absence of flavonoids. Presence of these secondary plant metabolites was in agreement with findings of (Doughari, 2006; Ahmad and Abdul, 2014). However, the findings of tannins was not in line with what was reported by (Ahmad and Abdul, 2014).

Antibacterial activity of the leaf aqueous extract of *T. indicahas* shown strong inhibitory activity against the test isolates which was in dose dependent manner and this is similar to the findings of (Doughari, 2006) and (Ahmad and Abdul, 2014). The activity might be attributed to the

presence of some of these metabolites which were reported to be responsible for the antimicrobial activity associated with some ethno-medicinal plant (Singh and Bhat, 2003). The activity of the plant extract reported in this study might be related to the presence of phytoconstituents such alkaloids, and tannins whose antimicrobial properties were documented (Tschebe, 1971).

This results of the study had demonstrated some antimicrobial properties of *T. indica* leaf extract that may serve in further ethno-medicinal and pharmacological future research.

## CONCLUSION

Phytochemical and antibacterial activity of leaf aqueous extract of *T. indica* showed that the plant possesses pharmacological activity against the test isolates which may be due to the presence of bioactive compounds present in the plant parts.

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