# Antimicrobial and larvicidal activities of different solvent extract of *Dieffenbachia picta* Schott.

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**Abstract**

The present study to investigation evaluates the antimicrobial and larvicidal activity of extract of *Dieffenbachia picta*. Antimicrobial and larvicidal activity were carried out of different concentration of the extract. The solvent methanol, chloroform, and petroleum ether were used for extraction. Antimicrobial activity was found to be highly effective in methanol extract. The fungal isolated tested include*: Epidermatophyton flaccosum, Microsporum gypseum*, and *Trichophyton mentagrophytes, Candida albicans.* The bacterial isolated tested include: Eschrichia coli, staphylococcus aureus, *Streptococus viridians, Vibrio cholera*. The zone of inhibition was measured and tabulated. The petroleum ether extract of the *D.picta* was the most effective and exhibited the highest mortality rate of 100% at a concentration of 1.00 µg/ml in 4$^{th}$ instar larvae of *Culex quinequefaciatus*.

Keywords: Antimicrobial, larvicidal activity, *Dieffenbachia picta, Microsporum gypseum,* Eschrichia coli, *Culex quinequefaciatus.*

## Introduction

Most of the plants that have been explored for medical use happen to be potentially poisonous one. Even now ethno pharmacology provides a valuable source for new pharmaceuticals, however, understanding of strengths and limitation of tradition give more possibility of selection medicinal materials in contrast to poisonous ones. Ancient medical system like Ayurveda and Chinese have this potential (Patwardhan, 2000). Dieffenbachia picta Schott. (Family - Araceae) is an ornamental perennial, herbaceous and common house plant. The common name dump plant, Tuft root and Mother in law's Tongue plant, (McGovern, 2000). Habit evergreen herb. Stem erect and unbranched distally, internodes distinct, green smooth with conspicuous annular leaf scars. Leaves large, centrally splotchy-white, numerous, thick, forming an apical crown, petiole sheath more thanhalf as long as petiole (Bailey,1954).

The members of Araceae have been used internally and externally for medicinal purpose. 61 species of Araceae have been used externally for a broad range of medicinal purpose. Many fewer species, have been used internally for an even broader array of medicinal purpose, including problems of the respiratory system, aches, infections, etc. (Croat, 1994)

## Material and Methods:

### Collection of plant material and preparation of extract

Fresh Leaves and stem sample of *Dieffenbachia picta*, Schott. were collected in Tamil Nadu Agri Horticulture society, Chennai. The plants were washed thoroughly and shade dried for about 25 days, powdered and extracted. About 25g of the sample was extracted with 250 ml of each solvent namely methanol, chloroform, and petroleum ether separately and kept overnight in shaker. The extracts were collected after filtration using Whatman No.1 filter paper and were stored. Extraction

was repeated three times. The extracts were concentrated using rotary vacuum evaporator 4˚C for further study.

**Antimicrobial screening**

The dried plant extract residues obtained was dissolved in 0.1% Dimethyl sulfoxide (DMSO) to get 100mg/ml concentration and served as the test extract for antibacterial and antifungal assay. Mueller Hinton Agar (MHA) medium was used to study the antibacterial activity and potato Dextrose Agar (PDA) was used to study antifungal activity.

**Test microorganisms**

The bacterial culture used in the study were Eschrichia coli, staphylococcus aureus, *Streptococus viridians*, *Vibrio cholera*, and fungal culture were *Epidermatophyton flaccosum*, *Microsporum gypseum*, and *Trichophyton mentagrophytes*, *Candida albicans*, were obtained from stock culture in the department of Microbiology, Sri Ramachandra University, Porur, Chennai. The organisms were on agar slant in test tube and stored in the refrigerator, prior to antimicrobial assay they were sub culture.

**Antibacterial activity assay**

The antibacterial activities of the extracts of the *Dieffenbachia picta* plants obtained with three different solvents, methanol, chloroform, and petroleum ether were evaluated by the agar well diffusion method. Under aseptic condition the autoclaved nutrient agar medium was poured into sterile Petri plate and allowed to solidify at room temperature. After solidification 24h bacterial culture was applied to plates containing nutrient agar medium using sterile cotton swabs. Then the wells were made by using sterile cork borer (5mm). the extracted were poured into the well by using micropipette. Each Petri plate had five wells. Each extract was added in the concentration of 25,50,75, 100 µg/ml into each well using a sterile micropipette. Streptomycin was used as a positive control for bacteria. The plates were labelled covered and incubated at 37˚C for 24h (Ganjewala et al., 2009).

**Antifungal activity assay**

Antifungal activity of the three extracts methanol, chloroform, and petroleum ether of the *Dieffenbachia picta* against epidermatophytic fungi. PDA medium were poured in sterilized Petri dishes and allowed to solidify. After solidification 24h bacterial culture was applied to plates containing nutrient agar medium using sterile cotton swabs. Then the wells were made by using sterile cork borer (5mm). the extracted were poured into the well by using micropipette. Each Petri plate had five wells. Each extract was added in the concentration of 25,50,75, 100 µg/ml into each well using a sterile micropipette. Ketoconazole was used as a positive control for fungi. The plates were labelled covered and incubated at 28˚C for 48h.

**Larvicidal Assay**

The 4$^{th}$ instar larvae of *Culex quinequefaciatus* were collected from Department of Zoology, Loyola college, Nungambakkam, Chennai, India. In the larvicidal assay, fourth instar larvae of *Culex quinequefaciatus* were exposed to test concentration of 25,50,75, 100 µg/ml of methanol, chloroform, and petroleum ether extracts in 100ml of water. Aliquots of 100ml of tap water were taken in a series of 250 ml glass beakers. The measured amount of extracts was dissolved in 1ml of the solvent which was used for preparing the extracts. The dissolved plant extracts were added to the water in the beaker. Control was also maintained by adding 1ml of solvent to 100ml water. Larva of 25 number per concentration was used for all the experiments. The number of dead larvae at the end of 24h was recorded and the mortality percentage values were calculated. This

experiments were repeated three times (Kumar and Maneemegalai,2008; Maragathavalli et al., 2012).

## Results and Discussion

The methanol, chloroform and petroleum ether extract of *D.picta* were screened for antibacterial and antifungal activity against four bacterial and four fungal. The results (Table 1 and 2) were compared with the control. The methanol extract possess strong antibacterial and antifungal activity as compared to the chloroform extract. No zone of inhibition was observed in petroleum ether extract. Methanol extract at the concentration of 100 µg/ml showed the highest zone of inhibition which was 2.9cm in *E.coli* Table (1) and 2.2 cm in *E.floccosum* Table (2). Less activity is observed in chloroform extract. Mulla Wahid et al. (2010) reported that ethanol extract of *Alocasia india* showed highest activity against bacteria. Dhanraj et al. (2013) and Chanda et al. (2013) reported that methanol extracts of *Colocasia esculenta* showed good activity against bacteria.

**Table.1. Antibacterial activity of the extract of *Dieffenbachia picta***

| Micro organism | Different concentration of the plant extracts (µg/ml) and zone of inhibition in cm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Methanol | | | | | Chloroform | | | | | Petroleum ether | | | | |
| | 25 | 50 | 75 | 100 | C | 25 | 50 | 75 | 100 | C | 25 | 50 | 75 | 100 | C |
| E.Coli | 0.4 | 1.1 | 1.7 | 2.9 | 3 | 0.1 | 0.3 | 0.4 | 0.6 | 2.6 | - | - | - | - | 2.5 |
| Staphylococcus aureus | 0.3 | 0.7 | 1.2 | 1.8 | 2.8 | 0.1 | 0.2 | 0.5 | 0.7 | 2.1 | - | - | - | - | 2.2 |
| Staphylococcus viridians | 0.2 | 0.4 | 1.3 | 2.2 | 2.9 | 0.2 | 0.3 | 0.6 | 0.9 | 2.6 | - | - | - | - | 2.8 |
| Vibrio cholerae | 0.3 | 0.6 | 1.1 | 2.1 | 2.7 | 0.1 | 0.2 | 0.4 | 0.5 | 2.5 | - | - | - | - | 2.8 |

**Table.2. Antifungal activity of the extract of *Dieffenbachia picta***

| Micro organism | Different concentration of the plant extracts (µg/ml) and zone of inhibition in cm | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Methanol | | | | | Chloroform | | | | | Petroleum ether | | | | |
| | 25 | 50 | 75 | 100 | C | 25 | 50 | 75 | 100 | C | 25 | 50 | 75 | 100 | C |
| Microsporum gypseum | 0.3 | 0.8 | 1.5 | 2 | 2.6 | 0.2 | 0.3 | 0.6 | 2.7 | 2.7 | - | - | - | - | 2.3 |
| Trichophyte .mentagraphytes | 0.2 | 0.4 | 1.1 | 2.1 | 2.8 | 0.1 | 0.2 | 0.5 | 2.9 | 2.9 | - | - | - | - | 2.6 |
| Epidermatophyton floccosum | 0.5 | 1.1 | 1.4 | 2.2 | 2.5 | 0.2 | 0.3 | 0.5 | 2.8 | 2.8 | - | - | - | - | 2.4 |
| Candida albicans | - | 0.1 | 0.2 | 0.5 | 2.6 | - | 0.1 | 0.3 | 2.8 | 2.8 | - | - | - | - | 2.8 |

Petroleum ether and methanol extracts was found to be very effective on 4$^{th}$ instar larvae of *Culex quinequefaciatus.* After 24h the number of dead larvae and the percentage mortality was compared with the control. No mortality was observed in the control, while 0.75 and 1.00 µg/ml concentration of extracts showed maximum effects on 4$^{th}$ instar larvae. The petroleum ether extract was highly toxic to the 4$^{th}$ instar larvae of *Culex quinequefaciatus*. Petroleum ether extracts showed 100% mortality at a concentration of 1.00 µg/ml in 4$^{th}$ instar larvae (Table 3). Methanol extract showed 94% mortality and chloroform extracts showed 62% mortality at a concentration of 1.00 µg/ml of 4$^{th}$ instar larvae. The effect of the plant extract was reported to be dose dependent as evident by an increasing in percent mortality with increasing concentrations. Ranaweera (1995) reported the dose dependency of the plant against mosquito larvae. Plant could be an alternative source for mosquito larvicidal because they constitute a potential source of bioactive chemical and generally free form harmful effects.

The methanol extract of the *D.picta* showed good antibacterial and antifungal activity whereas, the larvicidal activity was more in petroleum ether extract when compared to methanol extract. It may be due to the presence of saponins and thiols in the petroleum ether extract. Most saponins, readily dissolve in water, are poisonous to fish, since prehistoric times, people throughout the world have used pesticides plants, mostly those containing saponins, for fishing (Cannon et al., 2004). Thiols are organosulfur compound that contains a carbon-bonded sulfhydryl group. Thiols are often referred to as mercaptides. They bind with soft metals and leads heavy metal poisoning. The plant are promising as antimicrobial and as a larvicidal member in the array of flowering plants.

**Table. 3. Effect of *Dieffenbachia picta* on *Culex quinequefaciatus* larvae**

| Larvae | Extract | Concentration (µg/ml) | | | | Control | $LC_{50}$ |
|---|---|---|---|---|---|---|---|
| | | 0.25 | 0.50 | 0.75 | 1.00 | | |
| 4th Instar larvae Mortality % | Methanol | 14 | 40 | 82 | 94 | - | 52 |
| | Chloroform | 4 | 20 | 50 | 62 | - | 63 |
| | Petroleum ether | 26 | 55 | 92 | 100 | - | 41 |

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