



Effect of Natural Surface Secretes of Some Common Ornamental Plants Leaves on Pathogenic Micro-Organisms

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Abstract

This study presents the antimicrobial effect of natural surface secretes of some common ornamental plants leaves (*Ficus elastica*, *Philodendrom bipinnatifidum* and *Aglonema*) on some pathogenic bacteria (*Escherichia coli*, *P. aeruginosa* and *Staph. Aureus*), and fungi (*Microsporum gypseum* and *Aspergillus flavus*). It is concluded that all tested washing water of the plants leaves secretes exhibited various inhibitory effects, both *Philodendrom bipinnatifidum* and *Aglonema commutatum* have exhibited more antibacterial activity than *Ficus elastica*. While both *E. coli* and *P. aeruginosa* are more sensitive than *Staph. aureus*. The same inhibitory effects are observed when the plants leaves inoculated in their surface with pathogenic bacteria. In contrast to bacterial inhibitory effects, the washing water of natural surface secretes of tested ornamental plants leaves induced mycelium growth of both tested fungi. *Microsporum gypseum* mycelium growth induced more than *Aspergillus flavus* especially in case of the washing water of *Ficus elastic* that has the highest effects at 7.5/500 mL of medium. This study concludes that the uses of ornamental plants for the indoors and outdoors to control the growth of pathogenic microbes and problems associated with hospital.

Introduction

The world we live in is full of synthetic chemicals, most of which are toxic. They are encountered from our food to all the objects we touch. The “technology toxins” stalk inside your house, and the situation is nastier than you could imagine. The insidious aspect is that these toxins poison you most of the time, including while you are sleeping. Other indoor contaminants should be more obvious for you are microbial [1].

Human depended on many techniques to control these pollutants in situation life hospital, manufactures etc. The cultivation of plants was good oxygen resource and provide good psychological environment.

Plants have an almost limitless ability to synthesize aromatic substances, most of which

are phenols or their oxygen-substituted derivatives.

Most are secondary metabolites, of which at least 12,000 have been isolated, a number estimated to be less than 10% of the total. In many cases, these substances serve as plant defense mechanisms against predation by microorganisms, insects and herbivores. Some, such as terpenoids, give plants their odors; others (quinines and tannins) are responsible for plant pigment. Many compounds are responsible for plant flavor (e.g., the terpenoid capsaicin from chili peppers), and some of the same herbs and spices used by humans to season food yield useful medicinal compounds [2].



Studies showed that *Escherichia coli* causes UTI (urinary tract infection), diarrhea and septicemia.

Pseudomonas aeruginosa is a gram negative rod shaped bacterium which is a common cause of hospital acquired infections including burns and wound infections. The problems associated with hospital infection caused by *Pseudomonas aeruginosa* have become increasingly evident. The ability of this opportunistic human pathogen to acquire resistance to a broad range of antibiotics has made effective therapy more difficult [3].

Similar to fungal infections, they need new antifungal agents' continuation. Drug companies continue to focus on the development of antimicrobial drugs, especially with the increasing emergence of drug-resistant pathogens. Natural products are just one source of antimicrobial agents among today's world of chemical libraries and combinational syntheses, but they offer an almost unlimited reservoir of unique structures [4].

The aim of the present is to improve the antimicrobial effect of natural surface secretion of some common ornamental plants leaves for the indoors and outdoors to control the growth of pathogenic microbes.

Materials and Methods

Ornamental plants: Three most popular ornamental plants are chose for investigation including: *Ficus elastica*, *Philodendrom bipinnatifidum* and *Aglonema commutatum*.

Bacterial Isolates

Three clinical bacterial isolates of *Eschrechia coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* are collected from patients in Rizgary and Komary Hospital in Hawler city. All isolates are identified manually and morphologically [5]. Each bacterial isolate was activated in nutrient

broth (Oxoid) at 37 °C for 18-24 h then appropriate dilutions (10-1-10-5) are prepared using sterilized peptone water 0.1%. While two pathogenic fungal genera, *Microsporium gypseum* isolated from patient with dermatophyte infection, and *Aspergillus flavus* isolated from the soil are identified depending on macroscopic and microscopic examination of the culture isolates [6, 7].

Determination of Antibacterial Activity of the Plants

(1) Washing leaves: Leaves of each plant are cleaned and washed thoroughly by sterile distilled water (SDW) and left in ordinary room. Three days later the leaves of each plant washed with SDW and the solution obtained from the washing of each plant was screened for the antibacterial activity by well-diffusion method Muller Hinton medium (Hi-media India) was prepared and poured into sterile Petri-dishes to a depth of 4 mm, five pores each of 7 mm in diameter are made by a sterile cork-hole. The plates are inoculated with test bacteria by a sterile cotton swabs which dipped into diluted bacterial suspension (10-4), using a micropipette 200 µL of the solution is added to these pores and the plates are incubated at 37 °C for 18-24 h then the diameter of inhibition zones was measured in millimeter using a ruler [8].

(2) Inoculation of leaves: The whole leaf of each plant was inoculated with each of tested bacteria by a cotton swab after dipping into a bacterial cells suspension dilution (10-4). The plants are let at room temperature for 24 h.

(3) After 24 h the leaves are swabbed again after moistening with SDW and inoculated on appropriate media of each bacterial isolate. The plates are incubated at 37 °C for 24 h. The results are recorded by counting



numbers of bacteria remained and compared with initial dilution of (10-4).

Determination of Antifungal Activity of the Plants

The spore suspensions of selected fungi are prepared by adding 10 mL of sterile distilled water (SDW) on fungal plate culture media. Then spores are scraped by using sterile glass rod, later the spores suspension was transferred in to small sterile vial and mixed by magnetic stirrer (Gallenkamp /England) for 10 minutes. The spores are quantified using Hemocytometer, light microscope, and adjusted to ideal concentration (1×10^6 spores/mL). Then the spores are inoculated to the Petri dishes which contained washing water of the plants. Three replications are done for each concentration and incubated at 30 °C for optimum period for each fungus [9].

Results and Discussion

The results in Table 1 show the inhibitory effect of solution from washing of leaves of the investigated ornamental plants *Ficus elastica*, *Philodendrom bipinnatifidum* and *Aglonema commutatum* on the tested bacteria *E. coli*, *P. aeruginosa* and *Staph. aureus* (MRSA), the plants relatively exhibited various inhibitory effects, both of *Philodendrom bipinnatifidum* and *Aglonema commutatum* had shown antibacterial activity more than *Ficus elastica*.

Table 2 confirmed the antibacterial effect of the investigated plants by inoculating the plant leaves directly with determined number of the test bacteria to follow the growth of the bacteria on the leaves. It is obvious that the number of bacteria decreased after incubation on the leaves, this could be

attributed to the presence of active antibacterial compounds excreted by the plants. From the same table different inhibitory effects can be observed, *Philodendron bipinnatifidum* and *Aglonema commutatum* exhibit more inhibitory effect than *Ficus elastica* which may be due to the difference in the amount of active inhibitory compounds excreted by each plant.

Furthermore in a comparison between the effects of each plant on each test bacterial isolate as shown in Table 2, it is clear that *E. coli* and *P. aeruginosa*

showed more sensitivity than *Staph. aureus* which exhibited least sensitivity.

From the results obtained it can be concluded that all tested pathogenic bacteria are affected negatively when grew with the ornamental plants, thus it may be helpful to use ornamental plants in hospitals as an adjuvant in the treatment of bacterial infections. Table 3 shows the effects of leaves washing water of *Ficus elastica*, *Aglaonema commutatum*,

Philodendron bipinnatifidum on the mycelium growth (MG) of *A. flavus*.

From these results it appears that the washing water of the plants have proven to possess positive effect on the MG of *A. flavus*, since mycelium growth mean of *A. flavus* increased with increasing the volume of washing water in compare with control, and had higher effect at 7.5/500mL of the medium.. While the washing water of the *Philodendron bipinnatifidum* has the highest effect compared to other plants especially at 7.5/500 mL of the medium after 7 days of incubation at 30 °C.

Table 4 shows the effect results of different concentrations of washing water of ornamental plants.

**Table 1: Bacterial inhibition zone due to effect of plants leaves washing water.**

Bacterial isolate	Inhibition zone (mm) of water from washing of leaves		
	<i>Ficus elastica</i>	<i>Aglonema commutatum</i>	<i>Philodendrom bipinnatifidum</i>
<i>E. coli</i>	-	15	-
<i>P. aeruginosa</i>	15	-	20
<i>Staph. aureus</i>	-	15	20

Table 2 :Inhibitory effect of different ornamental plants against different pathogenic bacteria counts.

Bacterial isolate	No. of inoculated bacteria	No. of bacteria after incubation on the plant leaves		
		<i>Ficus elastica</i>	<i>Aglonema commutatum</i>	<i>Philodendrom bipinnatifidum</i>
<i>E. coli</i>	89×10^5	42×10^4	No growth	No rowth
<i>P. aeruginosa</i>	59×10^5	39×10^4	No growth	No growth
<i>Staph. aureus</i>	76×10^4	28×10^4	51×10^4	24×10^4

Table 3 : Effect of different concentrations of washing water of the plants on mycelium growth mean (cm) of *A. flavus* after 7 days of incubation at 25 °C.

Plants	Concentrations (mL/500 mL medium)			
	0	2.5	5	7.5
<i>Ficus elastica</i>	6.5	6.5	6.9	7.1
<i>Aglaonema commutatum</i>	6.5	6.6	6.8	7
<i>Philodendron bipinnatifidum</i>	6.5	6.7	7	7.2

Table 4 :Effect of different volumes of plant leaves washing water on mean growth of *M. gypseum* mycelium.

Plants	Concentrations (mL/500 mL medium)			
	0	1	3	5
<i>Ficus elastica</i>	3.5	4.1	4.9	5.4
<i>Aglaonema commutatum</i>	3.5	3.7	3.9	4.3
<i>Philodendron bipinnatifidum</i>	3.5	3.8	4.1	4.8

on the MG of *M. gypseum*, and appears that the washing water of the plants have positive effect on MG of *M. gypseum*, since the mycelium growth mean of the *M. gypseum* increased with increasing the volumes of washing water in each plants, that have higher effect at 7.5/500 mL of medium. The washing water of the *Ficus elastica* showed highest effect when compared with other plants especially at 7.5/500 mL medium. *Aglaonema commutatum* had showed lower

effect on increasing mycelium growth especially in volume 2.5/500 mL medium.

Conclusion

In conclusion, the washing water of the ornamental plants had higher positive effect on increasing the mycelium growth of *M. gypseum* compared to their effects on the *A. flavus*, especially *Ficus elastica*.



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تأثير الإفرازات السطحية لأوراق بعض نباتات الزينة على الكائنات الحية الدقيقة المسببة للأمراض

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الخلاصة

أظهرت هذه الدراسة تأثير الإفرازات السطحية الطبيعية لأوراق بعض النباتات الزينة الشائعة (*Ficus elastica*, *Philodendron bipinnatifidum* and *Aglonema commutatum*) ضد بعض أنواع البكتيريا المرضية (*Eschrechia coli*, *P. aeruginosa* and *Staph. Aureus gypseum*) وبعض أنواع الفطريات (*Aspergillus flavus* and *Microsporium*).

استخلص من النتائج أن مياه غسيل الخارجي لأوراق النباتات الزينة المستخدمة في التجربة جميعها لها افرازات متنوعة خارجية مثبطة للنمو. وكان للنباتين *Philodendron bipinnatifidum* و *Aglonema commutatum* تأثير مثبطة لنمو البكتيريا بنسبة اكبر من النبات *Ficus elastica*. وكانت العزلتين *P. aeruginosa* و *E.coli* اكثر حساسية للمواد الفعالة المفروزة من أوراق نباتات الزينة من العزلة *Staph.aureus*. كما لوحظ نفس التأثير المثبط للنمو عند تلقیح سطح أوراق النباتات بالبكتيريا المرضية. وعلى النقيض اتضح إن مياه غسيل إفرازات الطبيعية لسطح أوراق النباتات الزينة حفزت نمو مايسيليا للفطريات المرضية المعزولة. لقد تحفزت مايسيليا الفطر *Microsporium gypseum* بنسبة اكبر من الفطر *Aspergillus flavus* وخاصة في حالة مياه غسيل عند استخدامها بتركيز 7.5 / 500 مليلتر من الوسط الزراعي. استنتجت من الدراسة الحالية أن امكانية استخدام نباتات الزينة في الداخل والخارج المنزل تفيد للسيطرة على نمو الميكروبات المسببة للأمراض والمشاكل المرتبطة بعدوى المستشفيات.

الكلمات المفتاحية: نباتات الزينة، الإفرازات السطحية الطبيعية المضادة للميكروبات، الاحياء المجهرية المرضية.