ISSN 0975-6299 Vol.1/Issue-3/Jul-Sep.2010

International Journal of Pharma and Bio Sciences

ANTIMICROBIAL ACTIVITY OF THE BIODIESEL PLANT, *JATROPHA CURCAS* L.

K.KALIMUTHU* S.VIJAYAKUMAR AND R.SENTHILKUMAR[1]

*Department of Botany, Government Arts College (autonomous), Coimbatore – 641018, India.
[1] Institute of forest genetic tree breeding, Coimbatore – 641 013.

**** Corresponding Author*** k_kalimuthu@rediffmail.com

ABSTRACT

As a measure of testing the medicinal properties of *Jatropha curcas*, methanol extract obtained from both *in vivo* leaf and leaf derived callus were subjected to antimicrobial activity against six microorganisms, of the six different concentrations tested, the *in vitro* leaf callus extracts of at high concentrations (1.0 and 1.2%) inhibited the growth of *Staphylococcus aureus* and *Pseudomonas sp. at* maximum extend (20 and 23mm diameter in inhibition) The antifungal activities of the leaf extract *in vivo* was noteworthy . However, the methanol extract of leaf derived callus of *Jatropha curcas* showed higher antifungal activity with concominant increase in concentrations.

KEY WORDS

Callus, antimicrobial, plant extract, methanol.

INTRODUCTION

Plants are one of the most important sources of medicine. Plant derived compounds (phytochemicals) have been attracting much interest as natural alternatives to synthetic compounds. Extracts of plants were used for the treatment of various diseases and this forms the basis for all Indian systems of medicine. However, this area is not much developed when compared to modern system of medicine, mainly because of the lack of proper scientific substantiation in this field.

Mostly the pharmacological activity of medicinal plants resides in its secondary metabolites which are comparatively smaller molecules in contrast to the primary molecules such as proteins, carbohydrates and lipids. These natural products provide clues to synthesize new structural types of antimicrobial and antifungal chemicals that are relatively safe to man and it can help to meet expensive and limited supply of synthetic chemicals. The main advantage of plant products over the synthetic compounds in the treatment of diseases is that it is seen in the eukaryotic system and so it will not have a deleterious effect in higher plants and animals including man [1].

Jatropha curcas (Euphorbiaceae) is a biodiesel plant grown in various parts of India and other tropical countries. Preparations of all parts of this in the form of decoction are used in traditional medicine and for veterinary purposes also. The decoction of leaves is used against

cough and as an antiseptic after birth [2]. Latex has antimicrobial properties against many species [3]. The oil of this plant is used traditionally for the treatment of sciatica dropsy, paralysis, rheumatism, dysentery, diarrhea and certain skin diseases [4-9].To confirm the therapeutic value of this plant, in the present study *in vivo* leaf and leaf derived callus extracts by using methanol solvent was tested against four bacteria and two fungal pathogens.

The healthy leaves of *J.curcas* and *in vitro* derived callus (30 days old) were obtained from Classic Jatropha Oil (I) Ltd Palladam, Coimbatore for the present study.

In vivo leaves and *in vitro* callus were taken and homogenized separately with methanol. The extracts were filtered (What man No: 1 filter paper) and the filtrate was dried in room temperature. The dried materials were taken and redissolved in the same solvent made into known volume. From the known volume, six samples 0.2, 0.4, 0.6, 0.8, 1.0 and 1.2% solution were prepared. Antimicrobial activities of these extracts of various concentrations were assayed separately using well diffusion method in aseptic conditions. Freshly prepared nutrient agar and PDA media were used respectively for the bacterial and fungal species (*Pseudomonas sp., Klebriellasp. Staphylococcus aureus, Escherichia coli and Penicillium* sp*. and Mucor* sp).Different bacterial and fungal species were inoculated onto the medium by streak plate method. The strains were enriched before culturing.

Plant extracts with methanol (control) were filled in the well (4mm diameter) present on the medium. Bacterial cultures were incubated at 30±2ºC for 12-16 hours and the fungal cultures at the same temperature up to 48-52 hours. The assessment of the antimicrobial activity was based on the measurement of inhibition zone which diameter was measured up to the margin of the disc and expressed in mm.

Activities against different bacteria were varied with the concentration of extracts tested. The *in vivo* leaf extracts and leaf derived callus extracts of high concentrations (1.0 and 1.2%) inhibited the growth of the bacterial species *Staphylococcus aureus* and *Pseudomonas sp*. significantly on the other hand the inhibitory activity was hampered with the concominent decrease of extract concentration (Table 1 &2 ; Plate 1). Among the six microorganisms tested, the two bacterial species, *Staphylococcus aureus* and *Pseudomonas sp* were suppressed well (20 and 23mm dia) by the high concentration of methanol extract of leaf derived callus then the other organisms tested. In the similar fashion, the growth of these two bacterial species was also inhibited effectively by the *in vivo* leaf extracts. In addition it was noted that lower concentrations of extracts both *in vitro* derived callus and *in vivo* leaf inhibited the growth of the bacterium *E.coli* at lower level than any other microorganism tested. Moreover, the growth of the fungal species, *Penicillium* sp*., and Mucor* sp. was restricted considerably by various crude extracts of *Jatropha curcas*. Maximum antifungal activities were produced in leaf derived callus extract at the concentrations 1.0 and 1.2 %(Table 1). The lower concentrations of extract at 0.2, 0.4, 0.6 and 0.8% showed no or less inhibition zones.

The inhibitory activity of plant extracts is generally depends upon the concentration, type of parts used and microbes tested [10]. The accumulation and concentration of secondary metabolites which are responsible for inhibitory activity is varied according the plant parts [11 & 12]. It may be a reason for the variation in the inhibitory activity of extracts of *J.curcas*. Results of the present study support the folkloric usage of this studied plant and suggested that its methanol extract posses' compounds with antimicrobial properties that can be used as antimicrobial agents in new drugs for the therapy of infectious diseases caused by pathogens.

Table 1.
Effect of various concentrations of methanol extracts of leaf derived callus against various microorganism.

Concentration (in %) / Zone of inhibition in mm						
Organism	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**	**1.2**
Bacteria						
Pseudomonas	11	13	14	17	19	23
Klebsiella	10	10	12	13	14	19
Staphylococcus aureus	12	13	15	17	19	20
Escherichia coli	6	8	8	9	9	10
Fungi						
Mucor	-	-	6	7	7	9
Penicillium	-	5	7	8	9	10

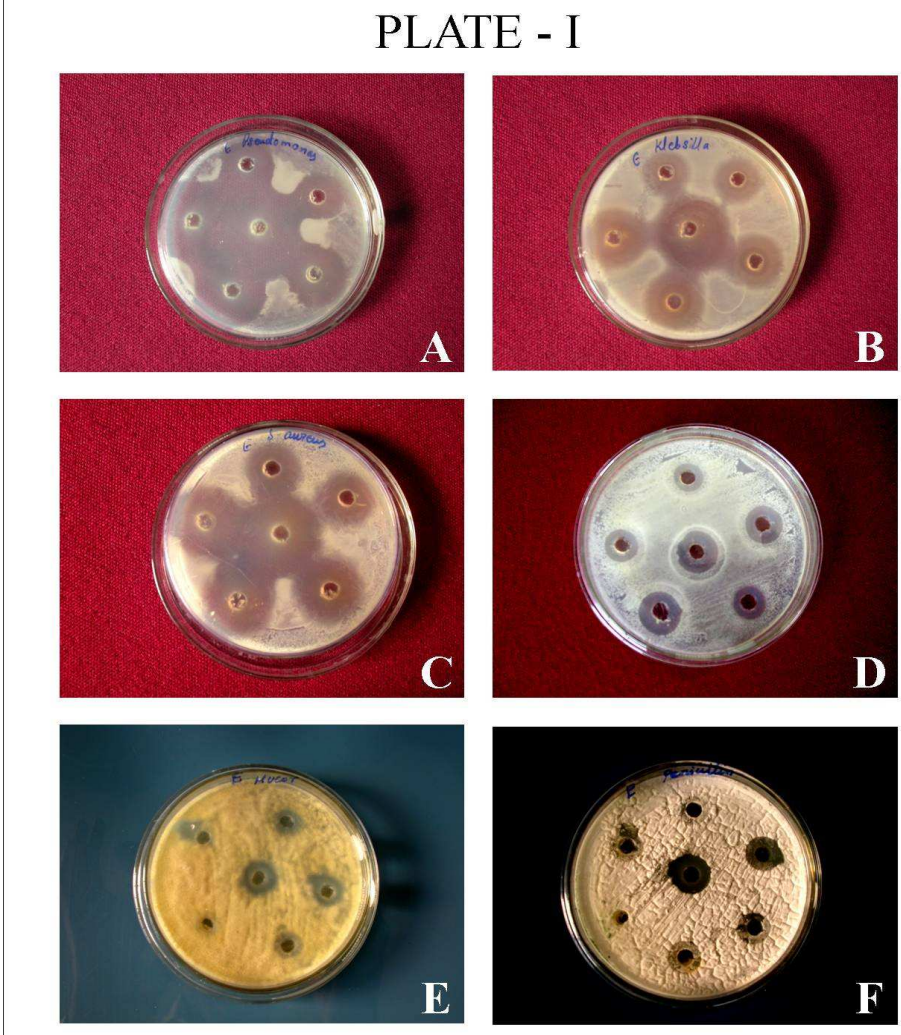
Table 2.
Effect of various concentration of methanol extracts of in vivo leaf against various microorganism.

Concentration (in %) / Zone of inhibition in mm						
Organism	**0.2**	**0.4**	**0.6**	**0.8**	**1.0**	**1.2**
Bacteria						
Pseudomonas	4	5	6	6	7	10
Klebsiella	-	3	4	4	5	5
Staphylococcus aureus	4	4	5	5	7	7
Escherichia coli	-	-	3	4	4	5
Fungi						
Mucor	-	-	3	3	4	4
Penicillium	-	-	-	3	4	5

PLATE – I

Effect of various concentrations of methanol extracts of leaf derived callus against various microorganism

A. *Pseudomonas*
B. *Klebsiella*
C. *Staphylococcus aureus*
D. *Escherichia coli*
E. *Mucor*
F. *Penicillium*



REFERENCES

1. Krishnakumar, T, Ranjini, C.E. and Sasidharan, V.K. Antibacterial and antifungal activity of secondary metabolites from some medicinal and other common plant species. J. Life Sci. Vol. 11. 14-19. 1997
2. Isawami, M.A. (1978) Nigerian chewing sticks. Nigerian field, 43: 50-58.
3. Thomas, O.O. Re-examination of the antimicrobial activity of *Xylopla aethiopica, Carica papaya, Ocimum gratissimum,* and *Jatropha curcas*. *Filoterapia* (Italy). 60(2): 147-155. 1989
4. Anonymous. Wealth of India, CSIR, New Delhi, Vol. V: pp.293. 1959
5. Desai, V.G. Aushadhi Sangraha, Shri, Gajanan. Book Depot. Dodar, Mumbai 914 (in marathi). 1975.
6. Dymock, C., Warden, C.J.H and Hooper, D. Pharamacographica India – A history of the principal drugs of vegetable origin, Bishen Singh Mahindra Pal Singh, Dehra Dun. 1976.
7. Nadkarni, A.K. Dr. K.M. Nakarni's Indian Material Medica Vol.1 Popular prakasham, Bombay. 705. 1976.
8. Agarawal, V.S. Economic Plants of India. Kailash Prakashan, Calcutta. 196. 1986.
9. Ambasta, S.P. The useful plants of India. CSIR New Delhi. 302. 1986.
10. Balandrin,M.F.,Jocke,A.J., Wurtele, E. Natural plant chemicals: sources of industrial and mechanical materials. Science .228: 1154-1160.1985.
11. Essawi.,T and Srours, M . Screening some Palestinian medicinal plants for antibactrical activity. J.Ethanopharmacol. 70: 343-349.2000.
12. Rekha Rajendran. Antimicrobial Activity of Different Bark and Wood of *Premna serratifolia* Lin.,IJ of Pharma and Bio Sciences.V1(1)2010.