International Journal of Life Sciences Research (IJLSR)
Vol. 1, Issue 1, pp: (5-10), Month: October-December 2013, Available at: www.researchpublish.com

Pest repellent potential of Mimusops elengi against some common pests in Jasminum sambac cultivation

Katheem kiyasudeen[1], Sultan Ahmed Ismail[2]

Department of Biotechnology

The New College, 87 peters road, Royapettah, Chennai-600014, Tamilnadu, India.

***Abstract*: Recent trends in agriculture practices especially pesticide usage, resulted in environmental pollution, soil health degradation, agrochemical residues in soil and economic residues of the crop. The need of an alternative pest control system which could provide environmentally safe and economically viable measures in the cultivation fields has become necessary. Mimusops elengi Linn (family Sapotaceae), a tree native to the Western Ghat region of peninsular India and also found growing in other parts of tropical and subtropical regions of the world such as Malaysia, Thailand, Burma, Pakistan and parts of Northern Australia. The tree is of religious and Ayurvedic importance. Extracts from the plant possess antibacterial, antifungal, anticariogenic, free radical scavenging, and anti hyperglycemic, anti diuretic effects and so on. Seeds are astringent to bowls, and bruised seed kernels are applied to treat constipation and to fix loose teeth. In this study, the seed extraction was made to be effective against the common pests in Jasminum sambac cultivation.**

Keywords:* Pest repellent, seeds, *Mimusops elengi, Jasminum sambac.

I. INTRODUCTION

Mimusops elengi Linn (family Sapotaceae) known as Bakul in Sanskrit, Tanjong in Malay, Pikul in Thailand and colloquially known as Bullet wood, Medlar wood and Spanish cherry in English is a tree found native to western peninsular region of South India (Mitra, 1981). The tree is of religious significance to the Hindus and served as a staple diet for sages, hermits and people in ancient Indian civilization (Mitra, 1981). Usually the fruit of the tree is a berry, 2.5-3 cm long and 1-1.5 cm broad, green when unripe and yellow or orange when ripe, one or two seeded, ovoid or ellipsoid often bearing at the apex a short bristle, the other end being attached to the persistent calyx, having five free sepals (Mitra, 1981).

The seeds are reported to contain Pentacyclic triterpenes, mimusopgenone and mimugenone (Sen, Sahu, & Mahato, 1995), Triterpenoid saponins, such as mimusopsides A and B, mimusopin, mimusopsin, mimusin, Mi-saponin A and 16a-hydroxy Mi-saponin A. Gallic acid (Boonyuen et al., 2009; Lavaud, Massiot, Becchi, Misra, & Nigam, 1996; Sahu, 1996; Sahu, Koike, Jia, & Nikaido, 1995; Sahu, Koike, Jia, & Nikaido,1997). Saponins like 3-O-(β-D-glucuronopyranosyl) 28-O-(α-L-rhamnopyranosyl (1→3) β –D-xylopyranosyl (1→4) [α-L-rhamnopyranosyl(1→3)] α-L-rhamnopyranosyl(1→2) α-L-arabinopyranosyl) protobassic acid, 3-O-(β-D-glucuronopyranosly) 28-O-(α-L-rhamnopyranosyl(1→3) β-D xylopyranosyl (1→4) α-L-rhamnopyranosyl(1→2) α-L-arabinopyranosyl) 16-α- hydroxyprotobassic acid and 3-O-(β-D-glucopyranosyl(1→3) β-Dglucopyranosyl) 28-O-(α-L-rhamnopyranosyl(1→3) β-D-xylopyranosyl(1→4) α-L-rhamnopyranosyl(1→2) α-L-arabinopyranosyl) protobassic acid have also been isolated from the seed kernel (Lavaud et al.,

1996).The pest repellent potential of the seeds of *Mimusops elengi* is investigated against some common pests in jasmine fields such as Mealy bugs, Aphids and Scale insects.

II. MATERIALS AND METHODS

2.1 Sample collection:

The ripe fruits of *Mimusops elengi* Linn were collected from Panaikulam (Latitude =N 9° 22' 27.0084" Longitude =E 78° 57' 15.4044") in Ramanathapuram District, Tamil nadu, India and allowed to air dry for 60 days. The seeds were then separated from the dried fruit body.

2.2 Extraction:

The seeds were ground, powdered and extracted using water (50g in 1 liter of water) for 24 hours as aqueous extract for the field application.

2.3 Pest profile:

Most common pests observed on the jasmine cultivations fields are as follows:

Common name	Binomial name
Bud worm	(*Hendecasis duplifascialis*)
Gallery worm	(*Elasmopalpus jasminophagus)*
Leaf web worm	*(Nausinoe geometralis)*
Leaf roller	(*Glyphodes unionalis)*
Jasmine eriophyid mite	(*Aceria jasmini)*
Red spider mite	(*Tetranychus cinnabarinus)*
Tingid bug	(*Corythauma ayyari)*
White fly	(*Dialeurodes kirkaldyi)*
Flower thrips	(*Thrips orientalis)*
Jasmine bug	(*Antestia cruciata)*

2.4 Field trial:

Field trial was conducted in two places in Thiruvalloor District, Tamil nadu, India (Table I & II)

2.5 GC analysis:

Gas chromatography was used for the detection of pesticide residue mainly OCP in the sample solution. The standard method followed was USEPA 525.5/508 using the instrument PERKIN ELMER, Clarus 500 at C.P.R. Environmental Education Centre, 1, Eldams road, Alwarpet, Chennai - 600 018, Tamilnadu, India.

2.6 Plant analysis after treatment:

2.6.1 Moisture:

Ten flower buds were randomly selected, weighed and kept in hot air oven at 120ºC for 12 hours. The dried flower buds were again weighed to measure the moisture content.

2.6.2 Chlorophyll content:

1g wet weight of fresh jasmine leaves were collected from control, chemically treated and organic repellent treated plants and shredded into bits with scissor. 5ml of water was added beads and homogenized. It was then made up to 10ml with water. 0.5 ml of the above was taken from the solution and mixed with 4.5ml of 80% acetone and centrifuged. The supernatant was collected and observed in spectrophotometer at 480, 645 and 663 nm.

2.6.3 Flower weight:

The weight of ten buds from the Control Chemically treated and organically treated plants (*Jasminum sambac)* were randomly taken during peak season of flowering and expressed in grams for comparison.

2.6.4 Shelf life of loose flowers:

From each treatment, ten randomly selected flowers were kept in polythene bags with ventilation. Shelf life of the flowers was assessed by recording the number of hours up to the 50% or more flowers maintained freshness without exhibiting brown pigmentation.

III. RESULTS AND DISCUSSION:

The use of aqueous extract has controlled the pests effectively than the chemical pesticides in the field. The cost of the organic pest repellent is very low when compared with chemical pesticides thus proving the natural farming provides wholesome flowers unlike chemical farming which carries harmful chemicals causing ill health. The Gas Chromatography analysis proved that the sample had no pesticidal residues which can bring about the same effect as chemical pesticides (Table 3). Since it was confirmed that the common pesticide chemical compounds were under below detection level (Table III), such natural products can be utilized for natural farming. The plant assays showed increased level of chlorophyll content, increased flower weight, increased moisture and shelf life than the chemical treatment (Table IV & V). The use of chemical fertilizers and pesticides had suppressed the chlorophyll content causing severe damages to the plants inside.

Sustainable agriculture is considered as the most viable means of meeting future food needs for the world's increasing population through the goal of balancing crop productivity, profitability, sustainability of environment and its impacts. The sustainable agricultural systems often use animal manure as a nutrient source for crops. The addition of these crops has positive impact on soil health and biodiversity. The concept of sustainable agriculture is predicted on a delicate balance of maximizing crop productivity and maintains economic stability while minimizing the utilization of finite natural resource and the environmental impact of associated agro chemical pollutants. To minimize the usage of agro chemicals, organic fertilizers administration is required. Though several organic fertilizers and pest repellents are available, little attention has been given for liquid fertilizers. By using chemical fertilizers and pesticides, the obtained yield became very low and the pests were controlled. Moreover the cost of the chemical pesticides and fertilizers are high and at times it exceeds the cost of yield resulting in increasing the loss.

IV. CONCLUSION

The use of chemical fertilizers has altered the biological ecosystem and also has a negative impact on microorganisms and human health. More importantly the soil health had faced an adverse change just because of the usage of chemical fertilizers and pesticides. It was started for increase in yield, faster production and time consumption but resulted in many damages which could not be retaliated. Organic farming is an alternative approach for crop production avoiding current system of chemical usage. It promotes soil health, increasing microbial load in the soil, cost effectiveness and eco-friendly. The solid organic fertilizers such as farmyard manure, compost, vermicompost, press mud, poultry manure has been shifted to the trend of using liquid fertilizers and pest repellents like Vermiwash, NCBT 01, Panchagavya, Gunapaselam etc., which can be used as foliar sprays.

The present investigation suggests the use of the aqueous extract in the form of foliar spray which controls the pests in jasmine cultivation fields can be used as liquid organic pest repellent. Along with Vermiwash, Gunapaselam and NCBT 01, it can be effective fertilizer as well as pest repellent.

Table I: Poorivakkam jasmine field profile

Name of the farmer	Mr. Gnyanasekhar.
Location	Poorivakkam village, Thiruvalloor district, Tamil nadu. (Latitude = N 13° 15' 28.1664", Longitude = E 80° 4' 41.9376")
Dilution tried	2%, 5% and 10%.
Effective dilution	2-5%
Gross plot size	100x40 feet (4000 square feet)
Spacing followed	1 foot per plant in rows of 50 plants each.
Rows observed	9
Control	3 rows (50x3 = 150 plants)
Organic treatment.	3 rows (50x3 = 150 plants)
Chemical treatment.	3 rows (50x3 = 150 plants)
Spacing between rows	1 m.

Table II: Pagalmedu jasmine field profile

Name of the farmer	Mr. Harikrishnan and Mrs. Kokila
Location	Pagalmedu village, Thiruvalloor district, Tamil nadu. (Latitude = N 13° 14' 14.8308"Longitude = E 80° 1' 15.6144")
Dilution tried	2%, 5% and 10%.
Effective dilution	2-5%

Gross plot 1 size	1220 square meters with 650 plants
Gross plot 2 size	820 square meters with 400 plants
Spacing followed	30 cm per plant
Spacing between rows	1 m.

Table III: Gas chromatography results

Test parameters	Results
O.P. – DDT	BDL (DL : 0.000035 mg/l)
P.P. – DDT	BDL (DL : 0.000037 mg/l)
O.P. – DDE	BDL (DL : 0.000035 mg/l)
P.P. – DDE	BDL (DL : 0.000035 mg/l)
O.P. – DDD	BDL (DL : 0.000034 mg/l)
P.P. – DDD	BDL (DL : 0.000078 mg/l)
Gamma HCH (Lindane)	BDL (DL : 0.000038 mg/l)
Alpha HCH	BDL (DL : 0.000037 mg/l)
Beta HCH	BDL (DL : 0.000034 mg/l)
Delta HCH	BDL (DL : 0.000036 mg/l)
Chloropyrifos	BDL (DL : 0.000061 mg/l)
2, 4 – D	BDL (DL : 0.00001 mg/l)
Butachlor	BDL (DL : 0.00003 mg/l)
Alachlor	BDL (DL : 0.000047 mg/l)
Atrazine	BDL (DL : 0.000054 mg/l)
Aldrin	BDL (DL : 0.000043 mg/l)
Dieldrin	BDL (DL : 0.000039 mg/l)

BDL - Below detection level; DL - Detection level

Table IV: Chlorophyll content

Content (g/l)	Control	Organic treatment	Chemical treatment
Total chlorophyll	3.56	5.33	1.86
Chlorophyll a	1.97	3.00	1.28
Chlorophyll b	1.55	2.27	0.0004
Carotene	0.06	0.10	0.04

Table V: Flower weight, Moisture and shelf life

S. No	Treatment	Weight (g)	Moisture (%)	Shelf life in hours
1.	Control	1.7 ± 0.010	84.44 ± 0.10	42 ± 1.33
2.	Chemical	2.1 ± 0.013	84.28 ± 0.20	45 ± 2.07
3.	Organic	2.4 ± 0.010	85.41 ± 0.009	49 ± 1.54

Values are expressed as Mean ± SD

Acknowledgement

Management of The New College, Chennai, India for the infrastructure facilities and C.P.R. Environmental Education Centre, Chennai for technical support.

REFERENCES

[1]. A.K. Singh (2006), Flower crops: Cultivation and Management, New India Publishing.
[2]. Bharath, G., Parabia, M.H. (2010), Pharmacognostic evaluation of bark and seeds of Mimusops elengi, International journal of Pharmacy and Pharmaceutical Science., 2(4), 110-113.
[3]. Dadang, Eva Dwi Fitriasari and Djoko Prijono (2009), Effectiveness of two botanical insecticide formulations to two major cabbage insect pests on field application, J.ISSAAS Vol. 15, No. 1: 42-51.
[4]. K. M. Hazra, R. N. Roy, S. K. Sen and S. Laskar(2007), Isolation of antibacterial pentahydroxy flavones from the seeds of Mimusops elengi, African journal of Biotechnology.
[5]. Manjeshwar Shrinath Baliga, Ramakrishna J. Pai, Harsith P. Bhat, Princy Louis palatty, Rekha kapoor (2011) Chemistry and medicinal property of Bakul (Mimusops elengi Linn): A review, Food Research International.
[6]. Nazarudeen, A., (2010), Nutritional composition of some lesser known fruits used by the ethnic communities and local folks of kerala. Indian journal of Traditional Knowledge
[7]. Satish, S., Raghavendra, M. P., Mohana, D. C., & Raveesha, K. A. (2008), Antifungal activity of a known medicinal plant Mimusops elengi against grain moulds, Journal of Agricultural Technology
[8]. Shah, P, J., Gandhi, M. S., Shah, M. B., Goswami, S. S., & Santani, D. (2003), Study of Mimusops elengi bark in experimental gastric ulcers, Journal of Ethnopharmacology.
[9]. Shahwar D and Raza MA., (2009)In vitro antibacterial activity of extracts of Mimusops elengi against gram positive and gram negative bacteria African journal of Microbiology Research.
[10]. Tilman, D (1999), Global Environmental Impacts of agricultural expansions; the need of sustainable and efficient practices, Proc. Natl. Acad. Sci. USA.96: 5995-6000.
[11]. Tilman. D., (2001), Forecasting agriculturally driven global environmental change. Science, 292: 281-284.