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Krishnananda P Ingle
Biotechnology Centre,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Amit G Deshmukh
Assistant Professor,
Nagarjuna Medicinal and Aromatic Plant Division,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Dipika A Padole
Biotechnology Centre,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Mahendra S Dudhare
Assistant Professor,
Vasantrao Naik College of Agril. Biotechnology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Yavatmal, Maharashtra, India

Mangesh P Moharil
Biotechnology Centre,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Khelurkar VC
Biotechnology Centre,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Correspondence
Krishnananda P Ingle
Biotechnology Centre,
Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola,
Maharashtra, India

Bioefficacy of crude extracts from *Jatropha* curcas against *Spodoptera litura*

Krishnananda P Ingle, Amit G Deshmukh, Dipika A Padole, Mahendra S Dudhare, Mangesh P Moharil and Khelurkar VC

Abstract
The crude methanolic extracts of *Jatropha curcas* (L.) were screened (leaf, bark, seed, seed coat and root) for insecticidal activity against third instar larvae of *Spodoptera litura* using leaf dip bioassay method. Among the tissues screened (leaf, bark, seed, seed coat and root), the leaf extract was most effective and showed highest mortality (60%) at 5% concentration as compared to other extracts followed by seed (20%), seed coat (20%) and root (20%).

Keywords: *Jatropha curcas* (L.), *Spodoptera litura*, insecticidal activity, plant extracts, methanol, dimethyl sulphoxide

1. Introduction
Jatropha curcas (L.) (*Euphorbiaceae*), has been considered as a "miracle tree" and an alternate source of fuel. The various plant extracts have been reported to have insecticidal and antihelminthic activities on vectors of medical or veterinary interest or on agricultural and non-agricultural pests. Among the different extracts, the phorbol esters fraction from seed oil has been reported as a promising candidate as a plant derived protectant of a variety of crops. However, the botanical extracts have not been widely used due to overuse of synthetic pesticides [1]. Applications of chemical pesticides minimize the threat from pest manifestation by rapid knock -down effect, with little consideration to the nutritional constituents of the crop [2]. The use of botanical pesticides for plant protection against insect pests has assumed greater importance as there is awareness all over the world due to ill effects of indiscriminate use of synthetic pesticides [3]. However the screening of plant extracts against insects are still continuing throughout the world to sort out the effective botanicals which is ecofriendly and can be use as economic biopesticide[4]. Therefore the present study deals with screening of various plant extracts for their insecticidal activity against *Spodoptera litura*.

2. Material and Methods
2.1 Collection of plant material
The plant material leaf, bark, seed, seed coat and roots of *Jatropha curcas* were collected from the college of Forestry, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola for extraction purpose.

2.2 Rearing of *Spodoptera litura*
Third instar larvae of *S. litura* were collected from horticultural field of Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola for mass rearing. The diet contains kidney bean flour (180g), yeast powder (28g), ascorbic acid (3.0g), methyl-p-hydroxybenzoate (2g), sorbic acid (1g), formaldehyde solution (2.0ml), agar (14g) and 500 ml distilled water. The powdered ingredients of diet weighed carefully and kept in separate containers. Agar was then added and brought to a boil followed by addition of bean flour to the boiled agar. All the powdered ingredients and liquid ingredients were added. The prepared diet was then poured into the desired number of sterilized rearing plates, allowed to cool and harden which could be then used as a insect diet for larval feeding [5]. The rearing was done in rearing rack at temperature 27 ^{0}C ± 1 ^{0}C, relative humidity 75 ± 1 percent and photoperiod approximately 13:11 light: dark hours. The larvae were reared on semi-synthetic artificial diet prepared as described above.

2.3 Extraction of secondary metabolites from *J. curcas*

2.3.1 Preparation of samples for extraction

For extraction purpose, leaf, bark, seed, seed coat and roots were used. All the plant parts were dried in hot air oven at 40 ^{0}C till they completely dried. All the dried samples were powdered using mixer grinder which was ultimately used for further extraction using methanol as solvent.

2.3.2 Reflux extraction

Soxhlet extraction was carried out with Universal Extraction System (Buchi). Ten grams of dried powder (leaf, bark, root, seed and seed coat) was taken in glass thimble and extracted with methanol as solvent. The procedure was carried out for 10 cycles for each extract and the temperature was adjusted just below the boiling point of the mentioned solvent. Most of the solvent from each extract was evaporated and the extracts were dried at room temperature. The weight of each extract was also noted as described by [6].

2.3.3 Preparation of sample extracts for bioassay

Accurately weighed 10 mg of extract and 1 ml of dimethyl sulphoxide was added to it and vortexed so that all the extract was dissolved to form a clear solution to make 1% solution. Similarly 5% concentrations of the extracts were prepared for the final bioassay against *Spodoptera litura*.

2.3.4 Bioassay against *Spodoptera litura*

Third instar larvae of *S. litura* were used for leaf-dip bioassay. Ten insects per extract were used and experiment was carried out in five replications. Castor leaves were first washed with distilled water containing 0.1% Triton-X-100, and dried for about 1 hrs. Castor leaves then dipped in the test solution of various extracts prepared in dimethyl sulphoxide and methanol to facilitate uniform treatment of active ingredients for about 10 second. Each leaf was kept in separate petri plate and then larvae were released in each petri plate. For, each extract, preliminary screening was done at a 5% concentration to test the mortality response of the test insect. Leaves were treated with dimethyl sulphoxide served as control. The petri plate containing treated leaves and released insects were then transferred to environmentally controlled growth chamber at a temperature 27 ^{0}C ±1 ^{0}C, 65 ±5 percent relative humidity for the assessment of insecticidal activity. Mortality count was recorded after 72 hrs treatment and moribund insects were counted as dead [7].

3. Results and Discussion

The crude methanolic extracts of plant tissues were evaluated for insecticidal activity against *Spodoptera litura* using leaf dip bioassay method [8]. The larval mortality was higher in case of leaf extract (60%), followed by seed (20%), seed coat (20%) and root (20%) as given in table 1 and figure 1 illustrate the moribund insect which was died after 72 hrs. The 40% and 80% larval survival from leaf extract and extracts from seed, seed coat and root showed notable larval weight reduction respectively after 72 hrs. As *S. litura* is a voracious pest, interruption in its feeding may have lead to its weight loss. When treated leaf was replaced with fresh leaf after 24 hrs, the remaining larvae initiated feeding but after 72 hrs their size and weight were reduced compared to control. This shows that leaf extract from *Jatropha curcas* can be further studied in order to identify potent biomolecule which can be utilized for new pesticide formulation and ultimately into pest management program.

Table 1: Screening of different extracts from *Jatropha curcas* for Insecticidal activity against *Spodoptera litura*

S.N.	Extract	Concentration %	% Mortality	% Pupation
1	Seed	5	20	0
2	Bark	5	0	0
3	Seed Coat	5	20	0
4	Leaves	5	60	0
5	Root	5	20	0
6	Control (DMSO)	-	0	0

(Total No of insects per extract = 10)

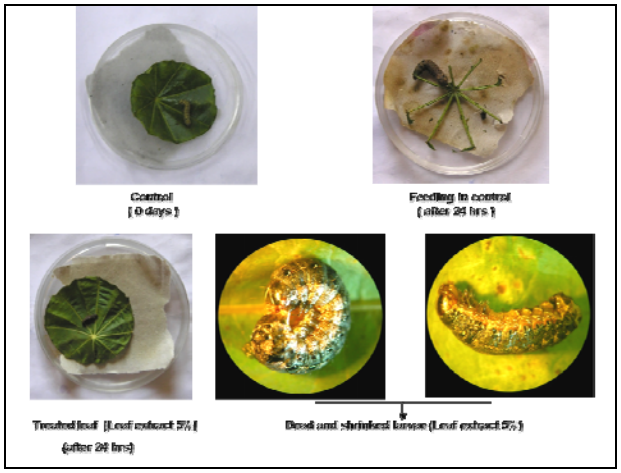

Fig 1: Bioassay of crude methanolic leaf extract from *Jatropha curcas* against *Spodoptera litura*

4. Conclusion

The present study revealed potential insecticidal activity of the leaf, seed, seed coat and root extracts of *Jatropha curcas.* Leaf extract showed highest mortality (60%). Overall, the study revealed that *Jatropha curcas* leaf has very good potency against insect and can be integrated in the management practices of agricultural pests. Further purification of extracts, characterization of active biomolecules and confirmation of bioactivity against a wide range of insects and plant pathogens will be helpful to identify new source of insecticidal activity which can be exploited for product development.

5. References

1. Ratnadass A, Wink M. The phorbol ester fraction from Jatropha curcas seed oil: Potential and limit for cop protection against insect pests. Int. J Mol. Sci. 2012; 13:16157-16171.
2. Alagarmalai Jeyasankar, Selvaraj Premalatha, Kuppusamy Elumalai. Antifeedant and insecticidal activities of selected plant extracts against Epilachna beetle, Henosepilachna, Vigintioctopunctata (Coleoptera: Coccinellidae). Advances in Entomology. 2014; 2(1):14-19
3. Bami HL. Pesticide use in India –Ten questions. Chemical Week, 1997; 4:7-10.
4. Jeyasankar A, Elumalai K, Raja N, Ignacimuthu S. Effect of plant chemicals on oviposition deterrent and ovicidal activities against female moth, Spodoptera litura (Fab.) (Lepidoptera: Noctuidae). Int. J of Agril. Sci. Res. 2013; 2(6):206-213.
5. Shorey HH, Hale RL. Mass- rearing of the larvae of nine Noctuidae species on a simple artificial diet. J econ. Ent.,

1965; 58:522-524.
6. Harborne JB. Phytochemical methods. Chapman and Hall Ltd.London. 1973, 49-58.
7. Birah A, Alpana B Singh, Mahapatrao GK, Gupta GP. Toxicity evaluation of Emamectin Benzoate against Tobacco Caterpillar (*Spodoptera litura*) by three different assay Techniques. Ind. J of Entomology. 2008; 70(3):200-205.
8. Tabashnik BE, Cushing NL, Finson N. Leaf residue vs tropical bioassay for assessing resistance in the DBM. (*Lepidoptera: Plutellidae*). FAO. Pl. Prot. Bull. 1987; 35:11-14.