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INSECTICIDAL ACTIVITY OF *Saraca asoca* AND *Terminalia arjuna* BARK EXTRACTS AGAINST *Sitophilus oryzae*

S. Gomathi and K.M. Subbu Rathinam*

PG & Research Department of Zoology, Rajah Serfoji Govt. College, (Autonomous "A" Grade), Thanjavur, Tamil Nadu, India
*Corresponding author

ABSTRACT

The aim of the study was to investigate the insecticidal activity of medicinal plants against rice insect pest, *Sitophilus oryzae*. Two different indigenous plants *Saraca asoca* and *Terminalia arjuna* bark extracts were screened for insecticidal activity against *Sitophilus oryzae*, which is a severe pest on rice. Among the plants screened, *Terminalia arjuna* bark extract showed higher activity against the selected pest as compared with *Saraca asoca* bark extract.. Preliminary phytochemical analysis revealed that the presence of alkaloid and quinines in the methanol extract indicate higher percentage of activities. Hence, it may suggest its use for controlling the rice insect pest, *Sitophilus oryzae*.

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Corresponding author
Dr. K.M. Subbu Rathinam, Department of Zoology, Rajah Serfoji Govt. College, (Autonomous "A" Grade), Thanjavur, Tamil Nadu, India

INTRODUCTION

Applications of chemical pesticides minimize the threat from pest manifestation by rapid knock-down effect, albeit with little consideration to the quality (nutritional contents) of the crop and agro-residues. Many workers reported that the indiscriminate use of chemical pesticide over a long period has not only been proved to be harm ful to soil microflora, animals and human life, but also contributed to a number of side effects, viz. development of resistance by the insects/weeds/pests resurgence and outbreak of new pests, toxicity to non-target organism, presence of non permissible level of pesticide residues on seeds, vegetables, fruits, border alteration in dynamics of pest species population, cumulatively causing poor soil fertility and hazardous effects on environment endangering the sustainability of ecosystem (Katyal and Satake, 1996; Kannaiyan, 2002). Due to higher dose and repeated frequency of application, every year one million people suffer from pesticide poisoning (Bami, 1997). The use of botanical pesticides for protecting crops from insect pests has assumed greater importance all over the world due to growing

awareness of harmful effects of indiscriminate use of synthetic pesticides.

MATERIALS AND METHODS

Plant materials:

The chosen herbal plants as *Saraca asoca* and *Terminalia arjuna* barks were collected in January 2015 from Karaikudi surroundings, Tamil Nadu.

Preparation of extracts

The collected *Saraca asoca* and *Terminalia arjuna* barks were washed several times with distilled water to remove the traces of impurities from the barks. The barks were dried at room temperature and coarsely powdered. The powder was extracted with aqueous and methanol for 24 hours. A semi solid extract was obtained after complete elimination of water and alcohol under reduced pressure. The extract was stored in desiccator until used. The extract contained both polar and non-polar phytocomponents of the plant material used.

Rearing of *Sitophilus oryzae*

The larvae were collected from rice goodown at Karaikudi, Sivagangai district, Tamil Nadu. Larvae were reared in laboratory condition at the Department of Zoology, Alagappa Government Arts College, Karaikudi, Tamil Nadu, India. These laboratory-reared larvae were used for bioassays and the cultures were maintained throughout the study period.

Evaluation insecticidal activity

The *Saraca asoca* and *Terminalia arjuna* bark extracts were applied (spiked) to 25g grain, by mixing to give 10, 25, 50, 75 and 100 milligram per kilogram. Controls for each set of treatments consisted of grain treated with water only. 10 unsexed *Sitophilus oryzae* was introduced into the glass jars containing the treated or untreated grains. The glass jars were covered with cotton cloths held with rubber bands. The number of dead insects in each jar was counted after 24 h and also after 7 d and the percentage insect mortality was calculated by Abbott's (1925) formula. Mc = (Mo Mc/100 Me) 100, Where, Mo = Observed mortality rate of treated adults (%), Me = mortality rate of control (%), and Mc = corrected mortality rate (%).

Statistical analysis

The percentage mortality observed was corrected using Abbott's formula. Statistical analysis of the experimental data was performed using the MS EXCEL 2011 to find out the LC_{50} values.

RESULTS AND DISCCUSSION

Botanicals are a rich source of organic chemicals on earth. Already 10,000 secondary metabolites have been chemically identified. In nature many plants have unpalatable substances like high content of phenols, alkaloids, flavanoids, terpenes, quinone, coumarin etc., which play a defensive role against particularly agriculture insect pests. Identifying sources with useful biological activity is only the starting point in the long process of development of a botanical pest management product. Success of botanical in the field depends on number of factors such as, ongoing availability of the natural resources, adequate biomass to justify extraction, the feasibility of extraction near the harvest site and the stability of the extract in storage after preparation (Isman et al., 1997).

Insecticidal activity of methanol extracts of *Saraca asoca* and *Terminalia arjuna* bark were studied at different concentrations (10, 25, 50, 75 and 100mg/kg.) and represent table 1 and 2. Insecticidal activity of solvent extracts was calculated based on larval mortality after treatment. High larval mortality normally indicates potential insecticidal activity of plant extracts. In the present study irrespective of concentration and solvents used for extraction the insecticidal activity varied significantly. Data pertaining to the insecticidal activity clearly revealed that maximum insecticidal activity was recorded in *Terminalia arjuna* bark extract. In the present study irrespective of concentrations used for the insecticidal activity varied significantly. Data pertaining to the insecticidal activity clearly revealed that maximum insecticidal activity was recorded in *Terminalia arjuna* bark as compared to *Saraca asoca* extract.

Table 1. Grain protection potential of *Saraca asoca* and *Terminalia arjuna* bark extracts on mortality response of stored-product insect *Sitophilus oryzae* on treated rice at 24 h exposure.

S.No.	Doses (mg/kg)	% of Mortality rate	
		Saraca asoca bark extract treated	*Terminalia arjuna* bark treated
1	10	15.30±1.56	18.20±1.98
2	25	33.21±2.30	40.32±2.80*
3	50	53.41±3.20	62.16±4.33*
4	75	67.74±4.65	78.64±5.62*
5	100	79.42±5.42	90.21±6.32*
	IC_{50}	52.92	41.92

Values are expressed as Mean± SD for triplicates

*Significantly different ($p<0.05$) from *Saraca asoca* compared by Duncan's multiple comparison test

Fig 1. Grain protection potential of *Saraca asoca* and *Terminalia arjuna* bark extracts on mortality response of stored-product insect *Sitophilus oryzae* on treated rice at 24 h exposure.

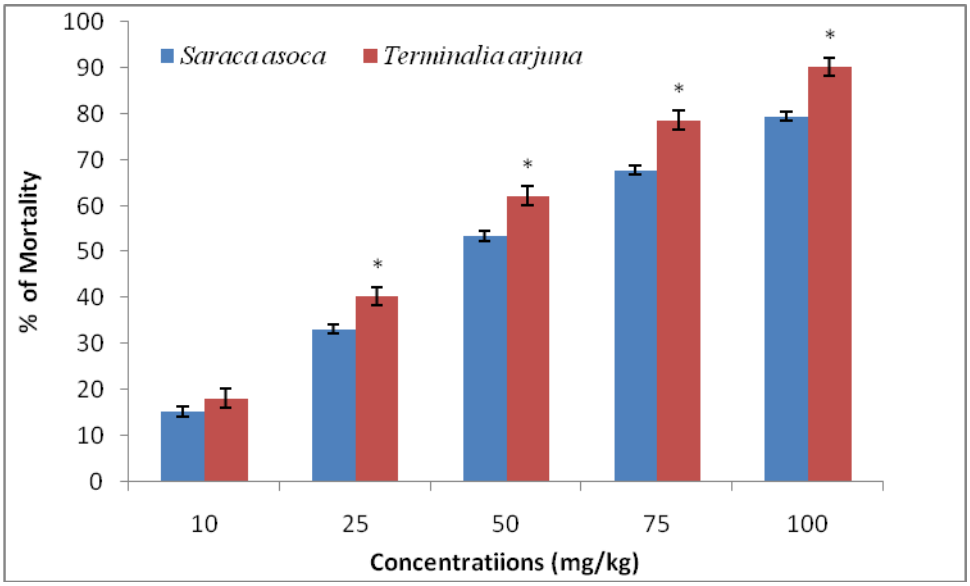


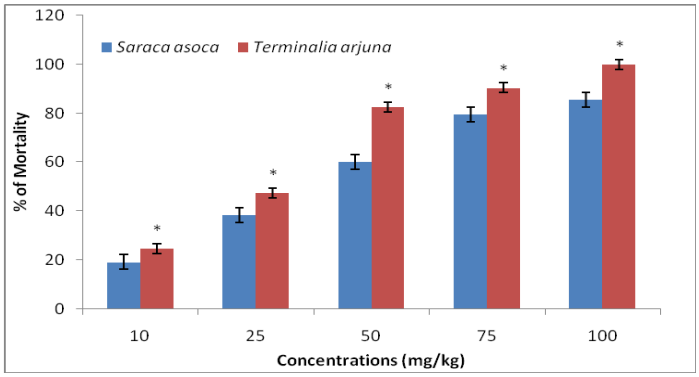
Table 2. Grain protection potential of *Saraca asoca* and *Terminalia arjuna* bark extracts on mortality response of stored-product insect *Sitophilus oryzae* on treated rice at 7 day exposure.

S.No.	Doses (mg/kg)	% of Mortality rate	
		Saraca asoca bark extract treated	*Terminalia arjuna* bark treated
1	10	19.21±1.85	24.75±2.56*
2	25	38.36±3.65	47.35±4.35*
3	50	60.25±5.86	82.46±5.76*
4	75	79.56±6.01	90.35±6.75*
5	100	85.65±6.63	100±7.02*
	IC_{50}	43.52	29.00

Values are expressed as Mean± SD for triplicates

*Significantly different ($p<0.05$) from *Saraca asoca* compared by Duncan's multiple comparison test

Fig 2. Grain protection potential of *Saraca asoca* and *Terminalia arjuna* bark extracts on mortality response of stored-product insect *Sitophilus oryzae* on treated rice at 7 day exposure.



Screening plant extracts for deleterious effects on insects is one of the approaches used in the search for novel botanical insecticides (Isman et aal., 2001, Lajide et al., 1993). Secondary plant compounds act as insecticides by poisoning per se or by production of toxic molecules after ingestion. In the present study *Terminalia arjuna* bark extract exhibited significant insecticidal activity at 100% concentration. It is possible that the insecticidal property present in the selected plant compound may arrest the various metabolic activities. In the present study preliminary phytochemical analysis revealed that alkaloid and quinines present in the *Terminalia arjuna* bark extract indicate that higher percentage of insecticidal activity observed in bark extract of *Terminalia arjuna* bark. Similar works have already reported insecticidal activity of many plants and their compounds against different groups of insects (Rajam, 1991; Bohnenstengel, 1999).

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