The Bioscan 5(4) : 653-654, 2010
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES

REPELLENCY AND TOXICITY OF SOME BOTANICALS AGAINST *SPODOPTERA LITURA* FABRIUS ON *GLYCINE MAX*. LINN (SOYBEAN)

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KEY WORDS
Acacia concinna
Spodoptera littura
Glycine max. Linn.
Probit analysis

Received on :
14.06.2010
Accepted on :
22.10.2010

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ABSTRACT
Bioefficacy of some botanicals was tested against *Spodoptera litura,* Fabrius on *Glycine max*. Linn. In present investigation *Acorus calamus, Acacia concinna, Terminalia chebula, Terminalia belerica* are selected for ethanolic extraction of their useful parts. Various dose levels were applied in the field of explore larvicidal potential of phytoextracts. Percentage mortality for various concentrations proved that *Acacia concinna* has effective potential with 85.2% mortality at 50 ppm dose level. Probit analysis gave median dose *i.e.* LC_{50}, 25.37 ppm, which can be sustainable solution for ecofriendly management of *Spodotera littura* on Soybean (*Glycine max*.), using *Acacia concinna* pod extract.

INTRODUCTION

Sustainable agriculture necessitates the use of eco-friendly technologies for protection of crops. Indiscreminate use of insecticides are well documented for their resistance in insect pests, destruction of beneficial organisms, resurgence of insect pests and pesticide residues in agricultural produce leading to health hazards and jeopardizing agricultural exports. This has dictated the need for development of ecologically safer chemicals with target specificity. Synthetic pesticides should be urgently replaced. Botanicals are one of the sources. Plants have secondary metabolites or allelochemicals providing biochemical or fundamental physiological process. More than 3,08,000 plant species have been identified of which only 2,400 plant species have been reported worldwide, to posses pest control properties. Biopesticidal efficacies within the plants are needed to be explored to increase number of biopesticidal formulations in market.

Spodoptera littura causes severe damage to crops like *Glycine max* (Soybean). 2nd instar larval population of *Spodoptera littura* infests crop within short period, leading 100% production loss. Phytochemicals need to be tested to control pest population in eco-friendly manner.

Toxicity of *Acorus calamus, Acacia concinna, Terminalia chebula* and *Terminalia belerica* were used with various dose levels. Mortality was recorded along with repellency of larvae (Robinson, 2006). Percentage mortality when statistically analyzed to give proper concentration of phytoextract, determined toxic nature of phytoconstituents. Farmers can be guided for use of perfect eco-friendly phytoextract against *Spodoptera littura*. The work will be a sustainable solution against agricultural pests.

MATERIALS AND METHODS

The plant material was collected from Dajipur, Radhanagari forest while *Acorus calamus* rhizomes were obtained from local shops. Material was sun dried and finely powdered.

Extraction: 25g powder of plant material was used for extraction using Soxhelt apparatus, in 250 mL ethanol for 10 hrs continuously. Extracts were kept in refrigerator as stock solution.

Dose Levels: Stock solution was diluted in water to prepare 5 different concentrations 10 ppm, 20 ppm, 30 ppm, 40 ppm, 50 ppm which were directly used to spray on infested leaves. Various dose levels were applied in fields to see the percentage mortality (Abott, 1925) in fields along with repellency and recorded as response by respondents.

Sampling: Infested leaves were studied in laboratory to count the number of 2nd instar larvae per leaf. It was observed that heavily infested leaf consists of approximately 250 larvae, it means the control was considered without spray leaf with 250 larvae (David and Papadespoular, 2003). Field trials were conducted in the form of Mr. Toraskar Santosh at Unchgaon village under Karveer Tahsil. Infested leaves were tagged with dose level concentration lables and 5 heavily infested leaves are sprayed with various concentrations.

Statistical Analysis: Mean mortality, percentage mortality is calculated and data is statistically analyzed using stats direct

Table 1: Larvicidal potential of phytoextracts against *Spodoptera litura* on *Glycine max* (Soybean)

Sr. No.	Dose level (ppm)	Mean Mortality of 3 samples (Responders)			
		Acorus calamus	*Acacia concinna*	*Terminalia chebula*	*Terminalia belerica*
1.	10	20	35	25	16
2.	20	56	97	69	35
3.	30	118	123	132	79
4.	40	125	187	148	120
5.	50	170	213	197	163

Table 2: Percentage mortality of *Spodoptera litura* larvae infesting soybean (*Glycine max*) spraying with phytoextracts

Sr. No.	Dose levels concentration (ppm)	% mortality *Acorus calumus*	*Acacia concinna*	*Terminalia Chebula*	*Terminalia belerica*	Control
1.	10	8	14	10	6.4	250
2.	20	22.4	38.8	27.6	14	
3.	30	47.2	49.2	52.8	31.6	
4.	40	50	74.8	58.8	48	
5.	50	68	85.2	78.8	65.2	

Table 3: Probit Analysis of larvicidal potential of phytoextracts against *Spodoptera litura* infesting soybean leaves (*Glycine max*)

	Acorus calamus	*Acacia concinna*	*Terminalia chebula*	*Terminalia. belerica*
Constant	-4.113322	-3.464383	-3.608777	-4.712348
Slope	2.653157	2.466692	2.440682	2.95312
Median dose	35.509924	25.378463	30.016833	40.821331
Heterogeneity (confidence interval)	33.192679-38.247577	20.405635-31.476999	25.618245-35.185675	32.44826-51.876264
Centile dose 90		70.769182	84.623321	111.938039
Confidence level (Heterogeneity)		44.870998-114.958866	57.7772-128.548514	62.279407-211.206601
Chi 2 (Heterogeneity at deviation from model)	7.690847	14.216896	7.874792	11.99034
For slope	14.554442	7.236039	9.251076	

software (Finney, 1948) for probit analysis to check toxic potential of phytoextracts against *Spodoptera litura*. (Banerjee and Kumar, 2006).

RESULTS AND DISCUSSION

Mean mortality for each extract concentration is counted and noted. Results are depicted in Table 1 for larvicidal potential of *Spodoptera litura*, *Acacia concinna* pod extract was found to be significantly superior at 50 ppm dose level which is proved to be more effective than other phytoextracts.

Table 2, Fig. 1 depicts % mortality of second instar larvae of *Spodoptera litura* of various dose levels, % mortality for *Acacia concinna* has proved most effective which is 85.2% for 50 ppm. % mortality for *Acacia concinna* extract for 40 ppm dose level is also rather effective which is 74.8% *Terminalia chebula* showed 78.8% mortality for 50 ppm dose concentration while *Acorus calamus* is moderately effective as it shown 68 % mortality at 50 ppm. *T. belerica* shown 65.2%, % mortality at 50 ppm dose level.

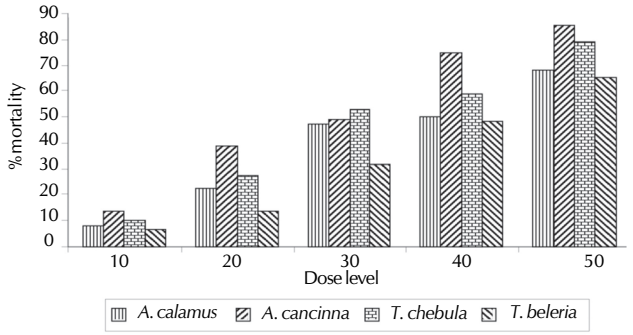

Figure 1: Toxicity of phytoextracts against *Spodoptera littura* larvae

Data analyzed for probit analys(Table 3) is provides median dose levels which are LC_{50} values. These values are beneficial for use of proper concentration to control the larval populations effectively. LC_{50} for *Acacia concinna* is lowest *i.e.* 25.37 which means 25 ppm dilution form of *Acacia concinna* pod extract can control 50% of larval populations with a single spray.

In other cases LC_{50} value varies which are 30.01 ppm for *Terminalia chebula,* 35.50 ppm to *Acorus calamus* and 40.82 for *T. beleria*. These concentrations are also showing efficacy of phytoextracts to control larval populations.

All the four plants have proved positive efficacy to control *Spodoptera litura,* Fabrius population which can provide a good eco-friendly source. LC_{50} values are helpful to make suitable formulations for field pest control. By considering statistically analyzed figures farmers can be guided to prepare doses and pest management programme can be designed by fixing number of spray trials to get 100% results.

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