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All author's name and affiliations are given below, after references

Efficacy of novel insecticides against castor whitefly, *Trialeurodes ricini* (Genn) and thrips, *Retithrips syriacus* (Mayet)

Radhakrishnan V, Ravi M, Sowmiya A, Arulprakash R, Allwin L, Vijay S, Vijayaprabhakar A, Karunakaran V, Periyar Ramasamy D, Harisudan C and Baskaran V

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Abstract
Field experiment was carried out at the Entomology Laboratory, Agricultural College and Research Institute, Vazhavachanur, Thiruvannamalai, Tamil Nadu, India during Rabi 2020 and to study the efficacy of insecticides with specific mode of action against thrips and whitefly in castor. The experiments were conducted with completely randomized block design along with ten replications. Minimum mean population of thrips 4.48/plant was recorded after two spraying of Buprofezin 25 SC @ 0.8 ml/lit of water whereas untreated check recorded 39.65 thrips/plant with a mean population reduction of 88.70 per cent over untreated control plot. Similarly, Buprofezin 25 SC @ 0.8 ml/lit recorded a lowest mean population of whitefly as 8.30/plant with a mean population reduction of 87.84 per cent over untreated control followed by Profenophos 50 EC @ 2 ml/lit and Azadirachtin 1% with a mean population reduction of 78.76 and 46.58 per cent respectively over.

Keywords: Thrips, castor, buprofezin, profenophos and azadirachtin

Introduction
Castor, *Ricinus communis* Linnaeus (Euphorbiaceae) is an important non-edible oilseed crop cultivated in India s mostly under rainfed condition. India ranks first in total castor production (FAO, 2020) [3] with 70% and 87% of world area and production, respectively (Agyenim-Boateng *et al*., 2018) [1]. The castor production is mainly limited by the sucking pests *viz.*, whitefly, *Trialeurodes ricini* (Genn) and thrips, *Retithrips syriacus* (Mayet) in the recent times (Ranganatha *et al*., 2021 and Ranga *et al*., 2022) [8, 7] with a yield loss potential up to 40 percent (Karan, 2014, Duraimurugan *et al*., 2015 and Patel *et al*., 2015) [5, 2, 6]. Farmer adopting insecticidal application as prime management strategy and apply insecticides having broad spectrum activity results in pest resurgence and also affect environment (Singh *et al*., 2020) [12]. Thus, the current study was proposed to study the efficacy of certain insecticides with specific mode of action against whitefly and thrips on castor.

Materials and Methods
Field experiment was conducted in completely randomized block design with ten replications at Agricultural College and Research Institute, Vazhavachanur, Thiruvannamalai, Tamil Nadu, India during Rabi 2020 to study the efficacy of insecticides with specific mode of action against thrips and whitefly. Castor F1 hybrid YRCH 1 seeds were sown at 120 cmx 90 cm and raised as per the package of practices recommended by Tamil Nadu Agricultural University. The insecticides were applied with high volume knapsack sprayer using solid cone nozzle when the insect pest attained the economic threshold. Observations on the incidence of sucking pests *viz.*, thrips and whitefly were recorded on target pests were done on five randomly selected plants per replication before the application of insecticide and 3,7,10 and 14 days after the insecticidal treatment. The incidence of insect pests is expressed as number of insects per plant.
The seed yield was recorded at each harvest and pooled. Gross income, net income and

Corresponding Author:
Ravi M
Associate Professor (Agricultural Entomology), ICAR – Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Salem, Tamil Nadu, India

benefit cost ratio (BCR) were worked out for each treatment. The data obtained from the field experiments were analyzed using AGRES ver. (7.01) after subjected to square root transformation (Gomez and Gomez, 1984) [13].

Results and Discussion

The results of the field experiment revealed that minimum mean population of thrips 4.48/plant was recorded after two spraying of Buprofezin 25 SC @ 0.8 ml/lit of water whereas untreated check recorded 39.65 thrips/plant with a mean population reduction of 88.70 per cent over untreated control plot. Profenophos 50 EC @ 2 ml/lit recorded 7.02 thrips/plant and Azadirachtin 1% @ 2 ml/lit recorded 20.72 thrips/plant with a mean population reduction of 82.30 and 47.74 per cent respectively over untreated control. Similarly Buprofezin 25 SC @ 0.8 ml/lit recorded a lowest mean population of whitefly as 8.30/plant with a mean population reduction of 87.84 per cent over untreated control followed by Profenophos 50 EC @ 2 ml/lit and Azadirachtin 1% with a mean population reduction of 78.76 and 46.58 per cent respectively over. The highest mean population whitefly was recorded in untreated check (68.27 /plant). Maximum yield (1790 kg/ha) was recorded in Buprofezin 25 SC @ 0.8 ml/lit treatment against 890 kg/ha in untreated check with a benefit cost ratio of (BCR) 1:3.65 and 1:2.10, respectively.

Geetha *et al*., 2020 [4] reported that profenophos 50EC @ 2 ml/l followed by buprofezin 25SC @ 1.5 ml/l was recorded lowest mean population of whiteflies in castor. Senthil Kumar *et al*., 2023 [10] recorded low population in Buprofezin 25 SC + Propiconazole 25 EC i.e., 3.25thrips/spike. Shambhavi *et al*., 2023 reported cyantraniliprole followed by buprofezin was effective against the sucking pest populations. In contrast, the present study revealed Buprofezin 25 SC @ 0.8 ml/lit recorded a lowest mean population of whitefly as 8.30/plant with a mean population reduction of 87.84 per cent over untreated control followed by Profenophos 50 EC @ 2ml/lit and Azadirachtin 1% with a mean population reduction of 78.76 and 46.58 per cent, respectively over control.

Table 1: Evaluation of insecticides on castor against thrips

Treatments	Number of thrips/spike/plant (Mean of five spikes per plant)*									Per cent reduction in population over untreated control
	1st spray				2nd spray				After two sprays Pooled mean	
	PTC	3 DAT	7 DAT	14 DAT	PTC	3 DAT	7 DAT	14 DAT		
T_1- Buprofezin 25 SC @ 0.8 ml/lit	19.40 (4.42)	5.20 (2.37)	5.00 (2.28)	5.80 (2.47)	28.40 (5.37)	0.80 (1.48)	1.60 (1.73)	9.20 (3.11)	4.48 (2.16)	88.70
T_2 - Profenophos 50 EC @ 2 ml/lit	16.20 (4.08)	4.80 (2.26)	4.60 (2.23)	7.80 (2.87)	32.80 (5.76)	9.60 (3.31)	8.40 (3.11)	10.00 (3.22)	7.02 (2.37)	82.30
T_3- Azadirachtin 1% @ 2 ml/lit	18.80 (4.37)	10.60 (3.31)	10.00 (3.17)	15.40 (3.98)	30.20 (5.54)	23.80 (5.02)	32.40 (5.82)	37.20 (6.12)	20.72 (3.07)	47.74
T_4 –Untreated control	15.60 (4.01)	18.20 (4.32)	20.00 (4.50)	29.20 (5.44)	36.20 (6.04)	52.80 (7.37)	59.20 (7.79)	68.60 (8.31)	39.65 (3.75)	-
SED	0.32	0.23	0.41	0.24	0.23	0.25	0.25	0.25	0.53	-
CD 0.05	0.69	0.50	0.89	0.53	0.51	0.54	0.54	0.55	1.28	-

Figures in parentheses are square root transformed values

Table 2: Evaluation of insecticides on castor against whitefly

Treatments	Number of whitefly/plant (mean of three leaves per plant)*									Per cent reduction in population over untreated control
	1st spray				2nd spray				After two sprays Pooled mean	
	PTC	3 DAT	7 DAT	14 DAT	PTC	3 DAT	7 DAT	14 DAT		
T_1- Buprofezin 25 SC @ 0.8 ml/lit	22.60 (4.80)	11.80 (3.49)	8.20 (2.94)	16.20 (4.08)	34.80 (5.94)	1.20 (1.26)	3.00 (1.87)	9.40 (3.13)	8.30 (2.52)	87.84
T_2 - Profenophos 50 EC @ 2 ml/lit	32.20 (5.72)	22.40 (4.78)	16.00 (4.04)	21.60 (4.70)	30.20 (5.53)	9.60 (3.16)	7.20 (2.74)	10.20 (3.26)	14.50 (2.93)	78.76
T_3- Azadirachtin 1% @ 2 ml/lit	30.60 (5.57)	27.20 (5.24)	36.00 (6.03)	47.40 (6.91)	32.00 (5.70)	29.20 (5.44)	33.20 (5.78)	45.80 (6.79)	36.47 (3.84)	46.58
T_4 –Untreated control	36.40 (6.07)	65.20 (8.10)	69.20 (8.34)	78.4 (8.88)	34.40 (5.90)	59.20 (7.72)	64.60 (8.06)	73.00 (8.57)	68.27 (4.80)	-
SED	0.14	0.26	0.28	0.43	0.22	0.25	0.34	0.26	0.37	-
CD 0.05	0.30	0.57	0.62	0.61	0.49	0.54	0.74	0.56	0.91	-

Figures in parentheses are square root transformed values

Table 3: Effect of insecticidal application on yield and economics of Castor

Treatments	Yield (Kg/ha)	Gross income (Rs.)	Cost of cultivation (Rs.)	Net income (Rs.)	BCR
T_1- Buprofezin 25 SC @ 0.8 ml/lit	1790	100240	27463	72777	1:3.65
T_2 - Profenophos 50 EC @ 2 ml/lit	1490	83440	28285	55155	1:2.95
T_3- Azadirachtin 1% @ 2 ml/lit	1140	63840	26711	37129	1:2.39
T_4 – Untreated control	890	49840	23733	26107	1:2.10

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Radhakrishnan V
Associate Professor, (Agricultural Entomology), Department of Entomology, Anbil Dharmalingam Agricultural College and Research Institute, Tamil Nadu Agricultural University, Tiruchirappalli, Tamil Nadu, India

Ravi M
Associate Professor, (Agricultural Entomology), ICAR – Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Salem, Tamil Nadu, India

Sowmiya A
Senior Research Fellow, ICAR – Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Salem, Tamil Nadu, India

Arulprakash R
Associate Professor, (Agricultural Entomology), Coconut Research Station, Tamil Nadu Agricultural University, Aliyarnagar, Tamil Nadu, India

Allwin L
Associate Professor, (Agricultural Entomology), V.O. Chidhambaranar Agricultural College and Research Station, Tamil Nadu Agricultural University, Killikulam, Toothukudi, Tamil Nadu, India

Vijay S
Teaching Assistant, (Agricultural Entomology), Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy, Tamil Nadu, India

Vijayaprabhakar A
Teaching Assistant, (Agronomy), Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy, Tamil Nadu, India

Karunakaran V
Assistant Professor, (Agronomy), ICAR - KrishiVigyan Kendra, Tamil Nadu Agricultural University, Needamangalam, Thiruvarur, Tamil Nadu, India

Periyar Ramasamy D
Assistant Professor, (Agricultural Extension), ICAR – Krishi Vigyan Kendra, Tamil Nadu Agricultural University, Needamangalam, Thiruvarur, Tamil Nadu, India

Harisudan C
Associate Professor, (Agronomy), Regional Research Station, Tamil Nadu Agricultural University, Vriddhachalam, Cuddalore, Tamil Nadu, India

Baskaran V
Assistant Professor, (Agricultural Entomology), Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu, India