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# Bio-efficacy of insecticides against *Conogethes punctiferalis* on castor

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ABSTRACT

Studies on bio-efficacy of insecticides against castor capsule borer, *Conogethes (=Dichocrocis) punctiferalis* Guenee on castor were carried out during *Kharif*, 2011-12. The results on efficacy of insecticides showed that chlorantraniliprole 20 SC @ 0.006 per cent and indoxacarb 14.5 SC @ 0.015 per cent were found superior and recorded 7.92 and 8.12 per cent capsule damage, respectively during spray schedule. At harvest, plots treated with chlorantraniliprole 20 SC (0.006%), indoxacarb 14.5 SC (0.015%) and emamectin benzoate 5 WG (0.002%) had found lower per cent capsules damage. Statistically higher castor seed yield was recorded in chlorantraniliprole @ 0.006% (3185 kg/ha), indoxacarb @ 0.015% (3110 kg/ha) and emamectin benzoate @ 0.002% (2760 kg/ha). However, cost benefit ratio was highest in indoxacarb 14.5 SC (1:16.62) followed by alphamethrin 10 EC (1:15.73) and chlorantraniliprole 20 SC (1:12.02).

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## INTRODUCTION

India is one of the world's principal producers of castor. The production of food and fibre to meet the needs of growing populations are undermined by pest problems (Waage and Barlow, 1993). In India, more than 63 species of insect and mite pests have been reported to cause damage to castor crop (Rai, 1976). The major problem limiting castor production in India is the susceptibility of released varieties/hybrids to a number of foliage feeders of which leaf eating caterpillar, *Spodoptera litura* and semilooper, *Achaea janata* cause economic yield losses. Now-a-days the capsule borer, *D. punctiferalis* is also a major and serious pest of all India importance and reported from all castor growing major areas (Anonymous, 1962). The pest attacks castor from reproductive stage onwards and continues till harvesting of the crop. Sometimes, it also acts as shoot borer. Kapadia (1996) reported that seed damage in infested capsules and weight loss of damaged seeds was 42.3 and 63.0 per cent, respectively in GCH 4 cultivar due to *C. punctiferalis*. The present study was, therefore, planned to evaluate some alternate (newer)

insecticides against *C. Punctiferalis* on castor under field condition.

## MATERIAL AND METHODS

The present investigation was conducted at Experimental Farm of Department of Entomology, B.A. College of Agriculture, Anand Agricultural University, Anand. The trials were laid out in a Randomized Block Design (RBD) having castor crop spacing of 120 cm between two rows and 60 cm within the rows in a gross and net plot area of 4.8 x 6.0 m and 2.4 x 4.8 m, respectively during first fortnight of August, 2011-12. The variety of castor, GCH 7 (Gujarat Castor Hybrid 7) was sown as per recommended package of practices, except insect pest management practices. Bio-efficacy of ten insecticidal treatments comprising ; chlorantraniliprole (Coragen 20 SC); emamectin benzoate (Proclaim 5 WG); thiodicarb (Larvin 75 WP); alphamethrin (Gem 10 EC); lufenuron (Match 5 EC); novaluron (Remon 10 EC); indoxacarb (Avaunt 14.5 SC); chlorfenapyr (Intrepid 10 EC) and carbaryl (Sevin 50 WP) were evaluated against *C. punctiferalis*. Two sprays of each insecticide were applied with knapsack sprayer upto the slight runoff on 23rd October, 2011 and 8th November, 2011. For the spraying of insecticides, 500 lit/ha volume of water used in each spray. For recording the observations, five plants were selected randomly from each net plot area. At reproductive phase, healthy and infested capsules was counted from three branches of each randomly selected plant at weekly interval starting from flowering stage (capsules formation) till harvest of crop. The observations were recorded at 1 day before first spray and 3, 7, 10 and 15 days after each spray. The capsule damage at harvest was recorded by observing the 50 capsules collected randomly from each net plot area. Castor seed yield recorded from all treated plots and according to seed yield and cost of plant protection the cost benefit (C:B) ratios were calculated. Data, thus, obtained were subjected to the angular transformation and statistically analyzed for interpretation.

## RESULTS AND DISCUSSION

Before first spray, there was no much difference in damaged capsules due to *D. punctiferalis* and the result was non-significant. The results suggested that the distribution of damaged capsules by *C. punctiferalis* in all the plots was homogenous. Data on the effect of different insecticides on the per cent capsule damage (Table 1) revealed that all the synthetic insecticides were significantly superior to reducing the capsule damage of *C. punctiferalis*. Three day after first spray, lower (5.82%) capsule damage by *C. punctiferalis* in plots sprayed with chlorantraniliprole and it was at par with other treatments significantly compared to the control except chlorfenapyr. The effect of chlorantraniliprole and it was at par with indoxacarb (6.47%), emamectin benzoate (7.46%), thiodicarb (7.51%) and novaluron (7.77%) in reducing the capsule damage by *C. punctiferalis* continued upto seven days after spray. On the ten days after spray, chlorantraniliprole (6.66%) proved effectiveness against *D. punctiferalis* and it was at par with indoxacarb (7.27%) and emamectin benzoate (8.29%) which reduced the capsule damage. Among the evaluated insecticides, chlorfenapyr recorded higher (10.40%) capsule damage followed by carbaryl and alphamethrin. Indoxacarb (8.22%) was found to be more effective insecticide after fifteen days after spray and was at par with chlorantraniliprole (8.29%), thiodicarb (10.03%) and emamectin benzoate (10.08%).

After second spray also, chlorantraniliprole, indoxacarb and emamectin benzoate found lower per cent damaged capsule significantly at three, seven, ten and fifteen days of spraying. Among the tested insecticides, the highest (15.73%) capsule damage was found in plots treated with chlorfenapyr followed by carbaryl, lufenuron and alphamethrin.

Data of pooled spray results (Table 1) clearly exposed that the treatment of chlorantraniliprole (7.92%) found significantly superior than all the evaluated insecticides and except indoxacarb (8.12%) against *C. punctiferalis*. The capsule damage was found 9.27, 9.61 and 9.77 per cent in plots treated with emamectin benzoate, thiodicarb and novaluron, respectively and they were at par with each other. The higher (11.14%) damaged capsules was observed in plots treated with chlorfenapyr and it was at par with carbaryl (10.80%), lufenuron (10.67%) and alphamethrin (10.46%). According to Narayanamma *et al.* (2010) also proved the superiority of indoxacarb (0.015%) in reducing the capsule damage due to *C. punctiferalis* with higher seed yield in castor. In contrast to this, Ganesha *et al.* (2014) recorded chlorpyriphos 50 EC (2 ml/lit.) was found best treatment which was at par with *Neem* oil (3 ml/lit.). Narayanamma and Reddy (2014) found that the flubendiamide 480 SC (20.00%), chlorantraniliprole 18.5

SC (19.30%), lambda cyhalothrin 5 EC (18.30%) and acephate (26.00%) recorded less per cent damaged capsules at one week after second spray.

Data presented in Table 1 on capsule damage at harvest revealed that per cent capsule damage in different treatments varied from 5.89 to 38.58 per cent. All the insecticidal treatments were significantly superior over untreated control. The per cent capsule damage was recorded significantly lowest (5.89%) in chlorantraniliprole treatment. Indoxacarb was also found minimum (10.64%) capsule damage at harvest and it was at par with emamectin benzoate (11.95%). The capsule damage observed in plots treated with thiodicarb and novaluron was from 17.95 to 19.83 per cent, respectively and they were at par with each other. Among the evaluated insecticides, the highest (31.97%) capsule

**Table 1: Effect of different insecticides on capsule damage by *C. punctiferalis* infesting castor**

| Treatments | Conc. (%) | Per cent capsule damage at Days After Spray (DAS) | | | | | | | | | | Capsule damage (%) at harvest |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Before | First spray | | | | Second spray | | | | Pooled | |
| | | | 3 | 7 | 10 | 15 | 3 | 7 | 10 | 15 | | |
| Chlorantraniliprole 20 SC | 0.006 | 13.33 (5.32) | 13.96 (5.82) | 14.52 (6.29) | 14.96 (6.66) | 16.73 (8.29) | 17.17 (8.71) | 17.80 (9.34) | 18.77 (10.35) | 19.15 (10.76) | 16.34 (7.92) | 14.04 (5.89) |
| Emamectin benzoate 5 WG | 0.002 | 13.48 (5.43) | 14.64 (6.39) | 15.85 (7.46) | 16.73 (8.29) | 18.51 (10.08) | 18.83 (10.42) | 19.56 (11.21) | 20.06 (11.77) | 21.02 (12.87) | 17.73 (9.27) | 20.22 (11.95) |
| Thiodicarb 75 WP | 0.075 | 13.92 (5.79) | 14.80 (6.53) | 15.90 (7.51) | 17.24 (8.78) | 18.46 (10.03) | 19.20 (10.82) | 20.09 (11.80) | 20.61 (12.39) | 21.32 (13.22) | 18.06 (9.61) | 25.07 (17.95) |
| Alphamethrin 10 EC | 0.01 | 14.61 (6.36) | 15.46 (7.11) | 17.39 (8.93) | 18.37 (9.93) | 19.59 (11.24) | 20.02 (11.72) | 20.72 (12.52) | 20.78 (12.59) | 21.99 (14.02) | 18.87 (10.46) | 29.31 (23.96) |
| Lufenuron 5 EC | 0.005 | 14.03 (5.88) | 15.73 (7.35) | 17.46 (9.00) | 18.36 (9.92) | 19.78 (11.45) | 20.08 (11.79) | 20.84 (12.66) | 21.36 (13.27) | 23.16 (15.47) | 19.07 (10.67) | 31.06 (26.62) |
| Novaluron 10 EC | 0.01 | 12.73 (4.86) | 14.83 (6.55) | 16.19 (7.77) | 17.52 (9.06) | 19.12 (10.73) | 19.47 (11.11) | 19.91 (11.60) | 20.56 (12.33) | 21.80 (13.79) | 18.21 (9.77) | 26.44 (19.83) |
| Indoxacarb 14.5 SC | 0.015 | 12.29 (4.53) | 14.01 (5.86) | 14.74 (6.47) | 15.64 (7.27) | 16.66 (8.22) | 17.24 (8.78) | 18.35 (9.91) | 19.25 (10.87) | 19.43 (11.07) | 16.56 (8.12) | 19.04 (10.64) |
| Chlorfenapyr 10 SC | 0.01 | 14.64 (6.39) | 16.20 (7.78) | 17.51 (9.05) | 18.81 (10.40) | 20.33 (12.07) | 20.64 (12.43) | 20.91 (12.74) | 22.19 (14.26) | 23.37 (15.73) | 19.50 (11.14) | 34.43 (31.97) |
| Carbaryl 50 WP | 0.2 | 14.51 (6.28) | 15.63 (7.26) | 17.40 (8.94) | 18.42 (9.98) | 19.74 (11.41) | 20.25 (11.98) | 20.88 (12.70) | 21.61 (13.56) | 23.32 (15.67) | 19.19 (10.80) | 32.34 (28.62) |
| Untreated check | - | 16.23 (7.81) | 17.68 (9.22) | 19.91 (11.60) | 21.26 (13.15) | 22.09 (14.14) | 23.28 (15.62) | 23.86 (16.36) | 25.55 (18.60) | 26.88 (20.44) | 21.97 (14.00) | 38.40 (38.58) |
| S.E. ± | | 0.80 | 0.62 | 0.75 | 0.66 | 0.70 | 0.77 | 0.92 | 0.80 | 0.84 | 0.33 | 1.26 |
| C.D. (P=0.05) | | NS | 1.86 | 2.24 | 1.97 | 2.09 | 2.28 | 2.74 | 2.37 | 2.48 | 0.98 | 3.76 |
| C.V. % | | 9.91 | 7.07 | 7.81 | 6.46 | 6.38 | 6.78 | 7.88 | 6.55 | 6.54 | 9.71 | 8.10 |

Figures in parentheses are retransformed values; those outside are angular transformed value

**Table 2: Economics of different insecticides used for the control of capsule borer in castor**

| Insecticides | Conc. (%) | Yield (kg/ha) | Increased in yield over control (%) | Net profit (Rs./ha) | Cost benefit ratio (C:B) |
|---|---|---|---|---|---|
| Chlorantraniliprole 20 SC | 0.006 | 3185 | 88.46 | 48304.65 | 1:12.02 |
| Emamectin benzoate 5 WG | 0.002 | 2760 | 63.32 | 33077.00 | 1:7.55 |
| Thiodicarb 75 WP | 0.075 | 2730 | 61.53 | 33357.55 | 1:10.97 |
| Alphamethrin 10 EC | 0.01 | 2393 | 41.57 | 23120.65 | 1:15.73 |
| Lufenuron 5 EC | 0.005 | 2340 | 38.47 | 19533.85 | 1:6.07 |
| Novaluron 10 EC | 0.01 | 2680 | 58.57 | 30128.60 | 1:6.67 |
| Indoxacarb 14.5 SC | 0.0075 | 3110 | 84.02 | 46882.45 | 1:16.62 |
| Chlorfenapyr 10 SC | 0.01 | 2056 | 21.68 | 9362.60 | 1:2.71 |
| Carbaryl 50 WP | 0.2 | 2227 | 31.76 | 15606.60 | 1:4.91 |
| Untreated check | - | 1690 | - | - | - |
| Labour charge: | For spraying- Rs. 170/labour/day; Market price of castor seed: Rs. 35/kg | | | | |

damage was observed in plots treated with chlorfenapyr and it was at par with carbaryl (28.62%) and lufenuron (26.62%).

**Economics :**

The data on economics of different insecticide presented in Table 2 indicated that all the insecticidal treatments recorded increased in marketable yield over untreated check. Chlorantraniliprole recorded highest marketable yield (3185 kg/ha), increased yield over control (88.46%) and net profit (Rs. 48304.65). The cost benefit ratio calculated on the basis of cost of protection of different insecticidal treatments revealed that indoxacarb was found superior as it recorded a profit of Rs. 16.62 per rupee invested followed by alphamethrin (1:15.73) and chlorantraniliprole (1:12.02). Though the treatment of alphamethrin proved moderately effective against *C. punctiferalis* and produced moderate level of yield (2393 kg/ha), but showed relatively higher ICBR (1:15.73) and stood second in rank. Perhaps this may be due to its least market price. This is in conformity with the reports of Narayanamma *et al.* (2010) evaluated the efficacy of newer insecticides against *C. punctiferalis* and concluded that indoxacarb @ 0.015% recorded higher seed yield (1552 kg/ha) and cost-benefit ratio (1:3.00). Narayanamma and Reddy (2014) recorded higher cost benefit ratio in plots treated with flubendiamide (1:5.8), spinosad (1:5.6) and chlorantraniliprole (1:5.3) against castor capsule borer.

Thus, the present studies revealed that chlorantraniliprole 20 SC (0.006%), indoxacarb 14.5 SC (0.015%) and emamectin benzoate 5 WG (0.002%) were superior in reducing the capsule damage and produce higher seed yield.

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