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# Bioefficacy of Modern Insecticides Against *Spodoptera Litura* Fabricius on Castor

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***Abstract* – Investigation on bio-efficacy of nine modern insecticides under field condition against *S. litura* on castor revealed that emamectin benzoate 0.005 per cent, chlorpyriphos 0.05 per cent, cypermethrin 0.016 per cent and Chloranthranilide 0.006 per cent were found the most effective. On the other hand indoxacarb 0.008 per cent and spinosad 0.009 per cent were found to be least effective. Looking to the efficacy of all the insecticides, emamectin benzoate 0.005 per cent, Chlorpyriphos 0.05 per cent, cypermethrin 0.016 per cent and Chloranthranilide 0.006 per cent can be advice to the farmers for the management of *S. litura* in castor.**

***Keywords* – Bioefficacy, Spodoptera Litura, Modern, Insecticides & Castor.**

## I. INTRODUCTION

Castor (*Ricinus communis* Linnaeus) is one of the most important oilseeds crop. India is the largest producer of castor seed and oil. It is of great importance for industrial, manures and medicinal use. Apart from fulfilling the internal demand of oil for various industries in recent years, it has played an important role in earning substantial foreign exchange through export of castor oil. The castor oil finds diversified application in industries and hence, there is a great demand in industrially developed countries. It is used in production of paints and varnishes, lacquers, sulfonated oils, artificial leathers, lubricants and greases, hydraulic fluids, cosmetics, soaps, printing ink and linoleum. It also serves as a raw material of various important chemical such as sebacic acid and for the manufacture of nylon. Futher, its cake is excellent manure containing 4.5 per cent nitrogen, 2.6 per cent phosphoric acid and 1.0 per cent potash. The castor hulls are used as manure after decomposition and its stalks are useful in manufacturing paper, cardboard and also widely used as a fuel and building huts.

Castor is one of the important cash crop which can be grown under varying soil types and erratic nature of monsoon due to its drought tolerance habit. The crop is cultivated in about 30 countries including India. India is the largest producer of castor seed and oil, which account for 5 per cent area and 64 per cent production in the world (Damodaran and Hegde, 2002).

In India the castor is cultivated in the states of Gujarat, Andhra Pradesh, Tamilnadu, Karnataka and Orissa accounting for about 90% of the area and production. It is cultivated in an area of 8.52 lakh hectare with a production of 10.2 lakh ton of castor seed with productivity being 1331 kg/ha during 2008-09 in India. Gujarat ranked the first in area and production with 4.03 lakh hectare producing about 8.5 lakh ton of castor seed annually along with an average productivity of 1972 kg per hectare (Anonymous, 2009).

Among the various pests attacking the crop, castor leaf eating caterpillar, *S. litura*, commonly known as tobacco caterpillar, a polyphagous pest is occurring in the entire castor growing countries in Asia, Australia and the Pacific basin (Feakin, 1973) and causes extensive damage to the crop at its initial stage. Its outbreaks also occur in Saurashtra region of the Gujarat State. Earlier, the pest was referred with different scientific synonymous viz., *Noctua litura* Mmssn, *Prodenia reline* Frans and *Prodenia litura* Fabricius (Anonymous, 1986b; Lefroy, 1908).

The loss caused by *S. litura* in different castor cultivars has been estimated to the tune of 12.0 to 23.50 per cent under Junagadh condition (Anonymous, 1986a)

As *S. litura* is one of the important pests and causes considerable damage to the crop, blanket use of insecticides have recommended for the effective and economic control of the pest in castor. The judicious application of insecticides created many adverse effects resulting in to environmental pollution and health hazards and development of resistance in *S. litura* to several insecticides.

## II. MATERIALS AND METHODS

A field experiment was conducted to ascertain the efficacy of modern chemical insecticides against *S. litura* infesting Castor. The details of the treatments are mentioned as below.

| Treatment | | Dose/ concentration |
|---|---|---|
| $T_1$ | Chlorantraniliprole 18.5SC | 0.006% |
| $T_2$ | Flubendiamide 39.35SC | 0.01% |
| $T_3$ | Spinosad 45SC | 0.009% |
| $T_4$ | Novaluron 10EC | 0.01% |
| $T_5$ | Cypermethrin 25EC | 0.016% |
| $T_6$ | Chlorpyriphos 20EC | 0.05% |
| $T_7$ | Methomyl 40SP | 0.05% |
| $T_8$ | Indoxacarb 14.5SC | 0.008% |
| $T_9$ | Emamectin benzoate 5WDG | 0.005% |
| $T_{10}$ | Control | - |

### *Application of Treatment*

### *Observations*

a. Observations on larval population of *S. litura* was counted from the five randomly selected plant from the net plot area before 24 hr of spray and subsequently observations were recorded at one, three and five day after spraying.

b. The data thus obtained were converted into per cent mortality by using the formula given by Abbott (1925) and modified by Henderson and Tilton (1955) and analyzed statistically.

$$\text{Corrected per cent mortality} = 100 \times \left(1 - \frac{T_a \times C_b}{T_b \times C_a}\right)$$

Where,
Ta = Number of larvae recorded after treatment
Tb = Number of larvae recorded before treatment
Ca = No of larvae recorded from check plot after treatment
Cb = No of larvae recorded from check plot before treatment

## III. Results and Discussion

An experiment was conducted under field condition to determine the bioefficacy of modern insecticides against *S. litura* on castor during *kharif* 2011-12. Spraying of various insecticides at mentioned dose was done twice, first application at ETL (one egg mass or one larval mass/plant) and the second spraying was done at 15 day after first spray. The data on percentage mortality obtained after each spray are summarized in Table 1 and 2.

### *First Spray*

The data on mortality of *S. litura* recorded at one day after first spray presented in (Table 1 & Fig. 1) revealed that chlorpyriphos 0.05 per cent showed significantly the highest mortality (82.74%) and it was on par with the treatment of cypermethrin 0.016 per cent (79.07%), methomyl 0.05 per cent (74.95%), novaluron 0.01 per cent (72.89), emamectin benzoate 0.005 per cent (72.16%) and indoxacarb 0.008 per cent (70.42). Whereas, the spinosad 0.009 per cent recorded significantly the lowest mortality (53.87%) and it was on par with chloranthranilide 0.006 per cent (67.23%) and flubendiamide 0.01 per cent (63.80%).

The data on mortality of *S. litura* recorded at three day after first spray presented in (Table 1 & Fig. 1) showed that emamectin benzoate 0.005 per cent showed significantly the highest mortality (95.10%) and it was on par with the treatment of flubendiamide 0.01 per cent (92.32%), chloranthranilide 0.006 per cent (91.15%) and cypermethrin 0.016 per cent (85.84%). On the other side, spinosad 0.009 per cent recorded significantly the lowest mortality (55.20%). Among the other treatments, chlorpyriphos 0.05 per cent, novaluron 0.01 per cent, methomyl 0.05 per cent and indoxacarb 0.008 per cent remained next best treatments by recording 84.14, 79.53, 77.70 and 72.70 per cent mortality, respectively.

The results on mortality of *S. litura* (Table 1 & Fig. 1) revealed that significantly the highest mortality was found in emamectin benzoate 0.005 per cent (95.72%) and it was on par with the treatments of flubendiamide 0.01 per cent (94.40%), chloranthranilide 0.006 per cent (93.22%) and cypermethrin 0.016 per cent (87.85%), whereas, the spinosad 0.009 per cent showed the lowest mortality (58.45%) on fifth day of first spraying. Among the other treatments, chlorpyriphos 0.05 per cent, novaluron 0.01 per cent, methomyl 0.05 per cent and indoxacarb 0.008 per cent remained next best treatments as they registered 86.80, 80.77, 78.02 and 72.74 per cent mortality, respectively.

### *Second Spray*

The data on mortality of *S. litura* recorded at one day after second spray presented in (Table 2 & Fig. 2) revealed that cypermethrin 0.016 per cent showed significantly the highest mortality (84.58%) and it was at par with the treatment of chlorpyriphos 0.05 per cent (81.97%), novaluron 0.01 per cent (75.21), emamectin benzoate 0.005 per cent (74.52%) and methomyl 0.05 per cent (72.42%), while the lowest mortality was found in spinosad 0.009 per cent (47.84%) and it was at par with the treatment indoxacarb 0.008 per cent (61.53%). Among the other treatments, chloranthranilide 0.006 per cent and flubendiamide 0.01 per cent remained next best treatments and recorded mortality to the tune of 68.81 and 64.67 per cent mortality.

The results on mortality of *S. litura* recorded at three day after second spray (Table 2 & Fig. 2) revealed that emamectin benzoate 0.005 per cent significantly recorded the highest mortality (94.55%) and it was at par with the treatments flubendiamide 0.01 per cent (92.93%), chloranthranilide 0.006 per cent (90.16%) and cypermethrin 0.01 per cent (85.69%). The next best treatments were chlorpyriphos 0.05 per cent, methomyl 0.05 per cent, novaluron 0.01 per cent and indoxacarb 0.008 per cent, which recorded 84.65, 80.80, 76.18 and 67.84 per cent mortality, respectively. The insecticide spinosad 0.009 per cent showed the lowest mortality (55.05%).

The mortality data of *S. litura* recorded on fifth day after second spray presented in (Table 2 & Fig. 2) revealed that chloranthranilide 0.006 per cent significantly recorded the highest mortality (93.58%) and it was on par with the treatments flubendiamide 0.01 per cent (93.17%), emamectin benzoate 0.005 per cent (92.87%), cypermethrin 0.016 per cent (84.95%) and chlorpyriphos 0.05 per cent (83.80%). Among the other treatments, methomyl 0.05 per cent and novaluron 0.01 per cent remained next best treatments which recorded 81.75 and 78.83 per cent mortality, respectively. The lowest mortality (61.90%) was found in spinosad 0.009 per cent and it was on par with the treatment indoxacarb 0.008 per cent (70.16%).

Thus, the present findings are more or less similar to the results reported by Bass (1978); Natesan and Balasubramanian (1979); Singh and Nath (1998); Virani (2000); Munir and Saleem (2004); Hosamani *et al.* (2008); Prasad *et al.* (2007); Tatagar *et al.* (2009) and Satanarayana (2010).

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TABLE 1: BIOEFFICACY OF MODERN INSECTICIDES AGAINST *S. LITURA* ON CASTOR DURING *KHARIF* 2011-12

| Sr. No. | Treatment | Concentration (%) | Corrected per cent mortality of *S. litura* after first spray | | |
|---|---|---|---|---|---|
| | | | 1 day | 3 day | 5 day |
| 1 | Chloranthranilide 18.5SC | 0.006% | 55.08* (67.23) | 72.69 (91.15) | 74.90 (93.22) |
| 2 | Flubendiamide 39.35SC | 0.01% | 53.01 (63.80) | 73.91 (92.32) | 76.31 (94.40) |
| 3 | Spinosad 45SC | 0.009% | 47.22 (53.87) | 47.98 (55.20) | 49.87 (58.45) |
| 4 | Novaluron 10EC | 0.01% | 58.62 (72.89) | 63.10 (79.53) | 63.99 (80.77) |
| 5 | Cypermethrin 25EC | 0.016% | 62.78 (79.07) | 67.89 (85.84) | 69.60 (87.85) |
| 6 | Chlorpyriphos 20EC | 0.05% | 65.45 (82.74) | 67.33 (85.14) | 68.69 (86.80) |
| 7 | Methomyl 40SP | 0.05% | 59.96 (74.95) | 61.82 (77.70) | 62.04 (78.02) |
| 8 | Indoxacarb 14.5SC | 0.008% | 57.05 (70.42) | 58.18 (72.70) | 58.53 (72.74) |
| 9 | Emamectin benzoate 5WDG | 0.005% | 58.16 (72.16) | 77.21 (95.10) | 78.07 (95.72) |
| | | S. Em. ± | 3.08 | 2.94 | 3.33 |
| | | C.D. at 5% | 9.16 | 8.72 | 9.91 |
| | | C.V. % | 10.32 | 8.62 | 9.59 |

*Arcsine transformed value. Figures in the parentheses are retransformed values

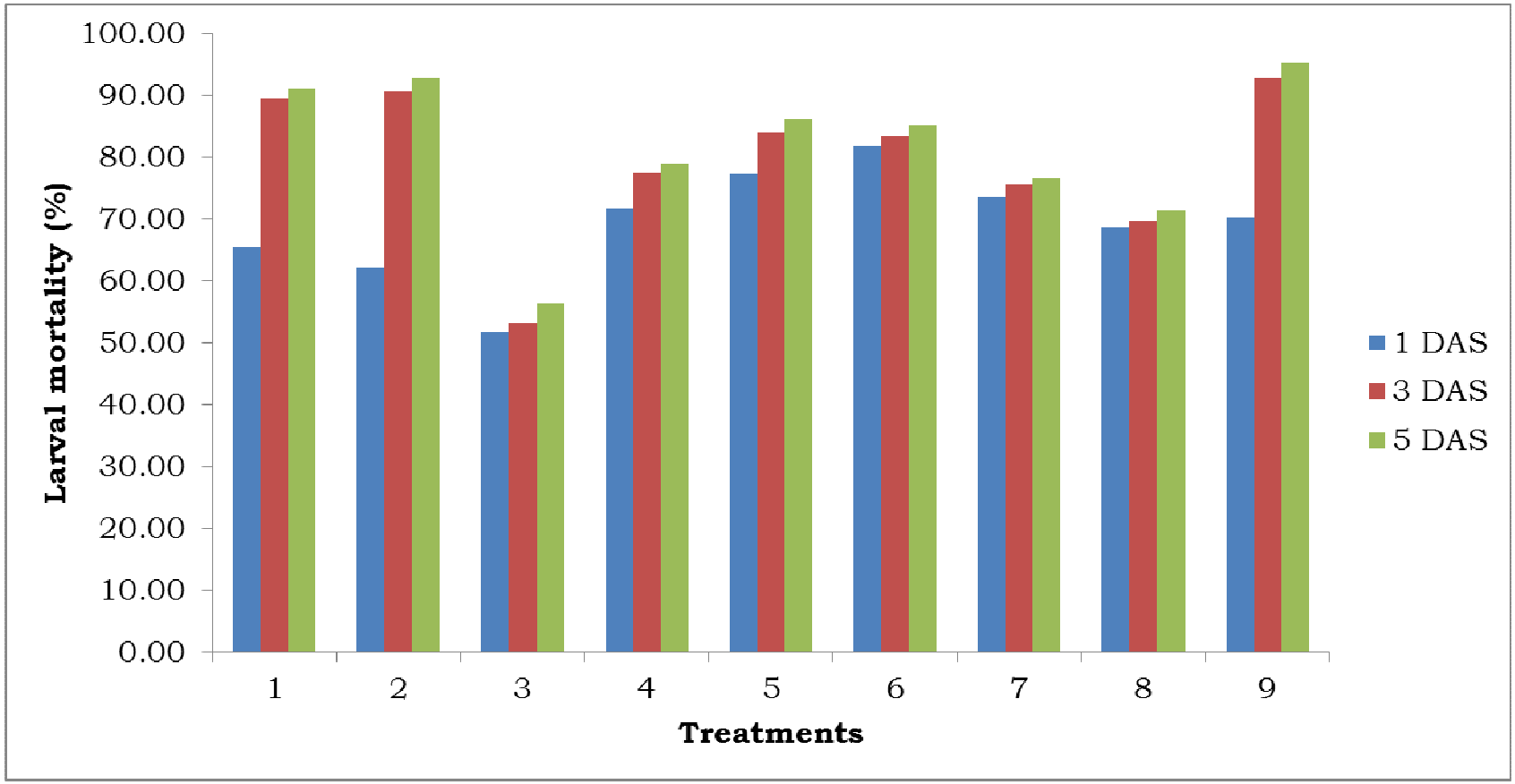


Fig. 1. Bioefficacy of modern insecticides against *S. litura* on castor after first spray during *kharif* 2011-12
DAS = Days After Spray

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TABLE 2: BIOEFFICACY OF MODERN INSECTICIDES AGAINST *S. LITURA* ON CASTOR DURING *KHARIF* 2011-12

| Sr. No. | Treatments | Concentration (%) | Corrected per cent mortality of *S. litura* after second spray | | |
|---|---|---|---|---|---|
| | | | 1 day | 3 days | 5 days |
| 1 | Chloranthranilide 18.5SC | 0.006% | 56.05* (68.81) | 71.74 (90.16) | 75.33 (93.58) |
| 2 | Flubendiamide 39.35SC | 0.01% | 53.53 (64.67) | 74.58 (92.93) | 74.85 (93.17) |
| 3 | Spinosad 45SC | 0.009% | 43.76 (47.84) | 47.90 (55.05) | 51.88 (61.90) |
| 4 | Novaluron 10EC | 0.01% | 60.14 (75.21) | 60.79 (76.18) | 62.61 (78.83) |
| 5 | Cypermethrin 25EC | 0.016% | 66.88 (84.58) | 67.77 (85.69) | 67.17 (84.95) |
| 6 | Chlorpyriphos 20EC | 0.05% | 64.88 (81.97) | 66.94 (84.65) | 66.27 (83.80) |
| 7 | Methomyl 40SP | 0.05% | 58.32 (72.42) | 64.01 (80.80) | 64.71 (81.75) |
| 8 | Indoxacarb 14.5SC | 0.008% | 51.67 (61.53) | 55.45 (67.84) | 56.89 (70.16) |
| 9 | Emamectin benzoate 5WDG | 0.005% | 59.68 (74.52) | 76.50 (94.55) | 74.51 (92.87) |
| | | S. Em. ± | 3.11 | 2.79 | 3.09 |
| | | C.D. at 5% | 9.23 | 8.30 | 9.19 |
| | | C.V. % | 10.45 | 8.26 | 9.01 |

*Arcsine transformed value. Figures in the parentheses are retransformed values

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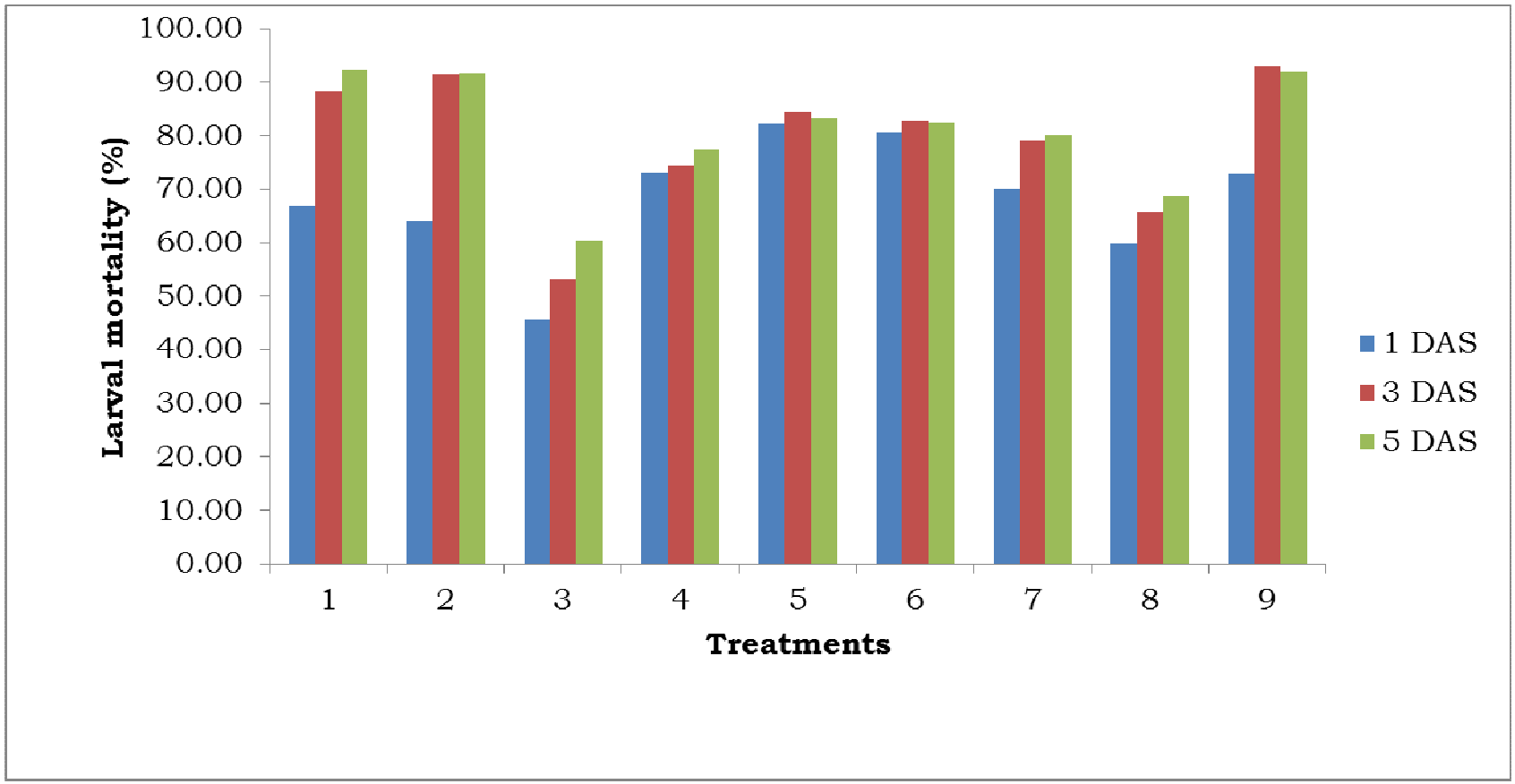


Fig. 2. Bioefficacy of modern insecticides against *S. litura* on castor after second spray during *kharif* 2011-12
DAS = Days After Spra