Pyrethroid resistance management in cotton

Biological activity and persistence of alternatives to pyrethroids for the control of the African Bollworm in Cameroon

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Introduction

In Cameroon, control failures of the cotton bollworm, *H. armigera,* were recently related with pyrethroid resistance. Research on alternative insecticides was required to implement a relevant resistance management programme.

The bollworm complex (*H. armigera/Earias* sp./*Diparopsis watersi*) constitutes a serious threat to cotton crops, particularly *H. armigera*, as a consequence of pyrethroid resistance (1). The biological activity and persistence of various alternatives to pyrethroid were investigated, to adequately position them in a new spraying programme.


Damaged boll (Ph. Brévault)


Cotton square devoured by *H. armigera* (Ph. Brévault)

Materials and methods

Field spraying

Insecticide spraying was performed with a low volume hand held sprayer (10 l.ha^{-1}). Then, terminal leaves were collected on plants and transported to the lab.

Five classes of insecticide chemistries were compared to a cypermethrin + profenofos mixture (36 + 150 g.ha^{-1} EC).

1. endosulfan (cyclodiene, EC,750 g.ha^{-1})
2. spinosad (spinosyn, SC, 36 g.ha^{-1})
3. emamectin benzoate (avermectin, EC, 10 g.ha^{-1})
4. indoxacarb (oxadiazine, SC, 25 g.ha^{-1})
5. thiodicarb (carbamate, DF, 750 g.ha^{-1})

Laboratory assay

Larvae were individually transferred on treated-leaf disc (5 cm diameter), contained in agar-coated Petri dishes.

Larvae were inspected 48 hours later for mortality.


Lab bioassays for assessing larval mortality (Ph.Brévault)

Mortality (%) was calculated by considering natural mortality in the control, according to the Abott's formula (2).

Results

Biological activity

Endosulfan, indoxacarb, thiodicarb and emamectin presented a promising efficacy on *H. armigera* larvae, while spinosad was less active against medium and large larvae *(Fig. 1)*.

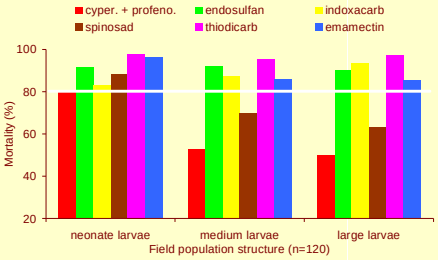

Figure 1. Mortality observed with alternative insecticides on different larval stages of the bollworm *H. armigera*.

All insecticide chemistries effectively controlled the other cotton bollworms: *Earias* sp. and *D. watersi* *(Fig. 2)*.

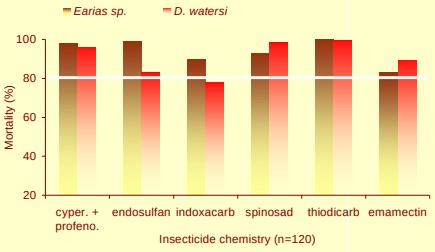

Figure 2. Mortality observed with alternative insecticides on field-collected bollworms : *Earias* sp. and *D. watersi*.

Persistence

Survey of insecticide residual activity showed a general decrease with time, which importance varied with rainfall *(Fig. 3)*.

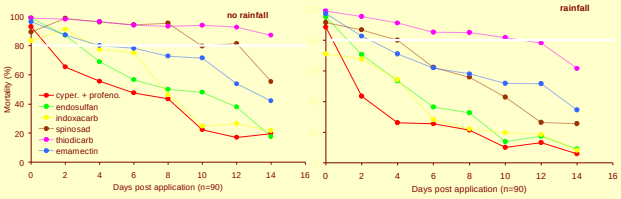

Figure 3. Mortality observed with alternative insecticides on neonate *H. armigera* larvae.

The residual activity under a rainfall regime (3) was consistent for thiodicarb (17 days), emamectin (10d) and spinosad (9d), but not so much for endosulfan (6d), indoxacarb (4d) or cypermethrin (3d).

Conclusion

According to their biological activity and persistence, promising insecticides may be recommended to small-scale African cotton growers as an alternative to pyrethroids for cotton bollworms control: thiodicarb, indoxacarb and endosulfan for "late season" spraying, spinosad and emamectin for "early season" spraying.

Our results should lead to rationalize the use of existing products, and to optimize the use of new chemistry, particularly for threshold based treatments (4), (5).

References

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