EMERGENCE OF TICK RESISTANCE TO ACARICIDES IN UGANDA: WHAT IS SO FAR KNOWN AND THE CHALLENGES A HEAD

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Introduction

There is a growing concern regarding the surge in the burden of ticks that seems 'resistant' to acaricides on the market. Dairy farmers in the West and Central Uganda are the most affected. In an effort to find solutions, some farmers have been submitting such ticks to COVAB for further investigation. This research work presents finding from dairy armer in Wakiso that has been a victim of such ticks challenge.

Materials and Method

The ticks used in the study were brought by a dairy farmer in Wakiso district. The ticks were identified in the Parasitology Laboratory and subsequent acaricide Bioassay were carried out in the Pharmaceutical Research and Embryology Laboratories in CoVAB.

Acaricides

Five types of acaricides were purchased from licensed Veterinary Pharmacies in Kampala. The above acaricides represented the different molecules (Synthetic pyrethroids, Organophosphates , Amidines and Co-formulated) that are on the market.

Adult Immersion Test

The different acaricides were diluted according to the manufacturers instruction for recommended EC. However, double strength acaricide solutions were also used for the adult immersion test. After immersion, the ticks were incubated and observed daily for 7 days for mortality and egg laying inhibition.

Adult immersion

Engorged ticks laying eggs after immersion

Hatching the eggs to obtain larvae for LPT

To determine whether there was resistance , eggs were harvested from the engorged females that were immersed. The eggs were incubated at 80% RH and 5% CO2 to obtain the larva

Incubation of the eggs

Hatched Eggs (10 day old larvae

Larval Packet Test (LPT)

The method provided by Johnson et al (2007) was used with minor modification. The different acaricides were serially diluted to 5 concentration levels with the median concentration being the EC. 60 larvae were used in each dilution and the test was carried out in duplicates.

Modified** LPT under **incubation

Enumeration of dead larvae

Key findings

Tick species : The ticks were identified as *Boophilus decoloratus.* The ticks were suspected to have originated from Bushenyi district, where the farmer purchased some breeding cattle prior to the problem. A sharp rise in incidence and mortalities due to tick-borne diseases were also recorded on the farm.

Efficacy of the acaricides on Adult ticks

Out the four molecules that were used to represent all the acaricides on the market, only 1 was effective against the adult ticks. Synthetic pyrethroids (Delta 1 and Cyp- α) and the amidine (Amitraz) did not cause significant mortality to the ticks even at higher concentration (twice the recommended). The co-formulated product (POP) caused up to 75% mortality at recommended concentration. The above effect was attributed to Chlorphenvinphos, an organophosphate compound which is co-formulated with α-Cypermethrin (Table 1)

Table 1:Average percentage mortality of adult ticks

Assay	Day 3		Day 5		Day 7	
	Recom'd	Double	Recom'd	Double	Recom'd	Double
Control	0	0	0	0	0	0
Delta 1	0	5	0	10	0	20
POP	30	60	65	70	75	75
Cyp- α	15	20	25	35	35	35
Amitraz	0	5	5	25	5	25

Efficacy of the major acaricides on the larvae

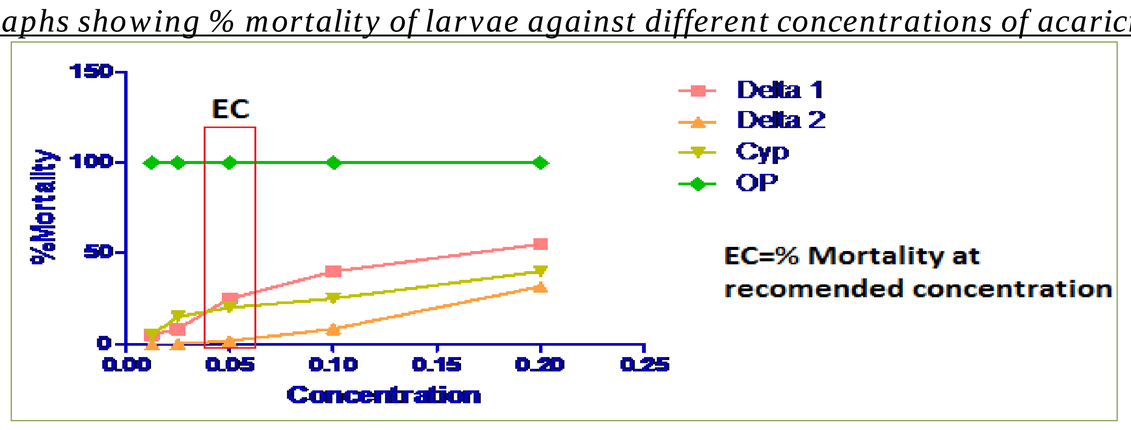
Organophosphate based formulations caused 100% mortality even at concentrations below the recommended EC. However, insignificant mortalities were recorded in the synthetic pyrethroid and amitraz groups.

Table 2: Percentage mortality of larvae against different concentrations of acaricides

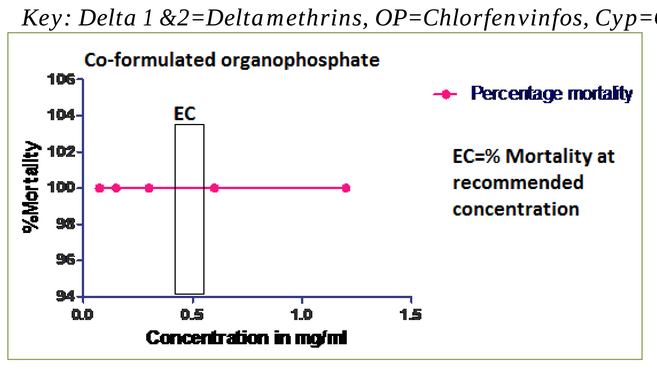
ACARICIDE AND STRENGH	CONCENTRATION mg/ml	AVERAGE NO. OF LARVAE COUNTED	AVERAGE NO. OF LARVAE ALIVE	AVERAGE NO. OF LARVAE DEAD	PERCENTAGE MORTALITY
Delta1 50mg/ml Deltamethrin	0.0125	60	57	03	5
	0.025	60	49	11	8.3
	0.05	60	45	15	25
	0.1	60	36	24	40
	0.2	60	27	33	55
Delta 2 50mg/ml Deltamethrin	0.0125	60	60	00	0
	0.025	60	60	00	0
	0.05	60	59	01	1.7
	0.1	60	55	05	8.3
	0.2	60	41	19	31.7
Cyp-α 50mg/ml Cypermethrin	0.0125	60	57	03	5
	0.025	60	51	09	15
	0.05	60	48	12	20
	0.1	60	45	15	25
	0.2	60	36	24	40

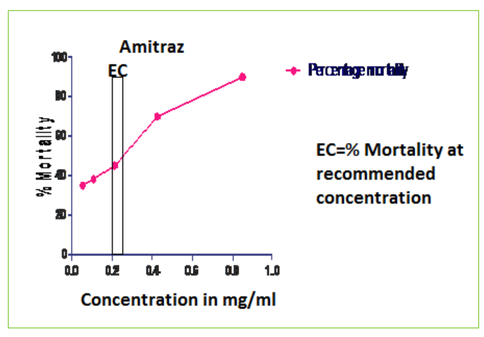
ACARICIDE AND STRENGH	CONCENTRATION mg/ml	AVERAGE NO. OF LARVAE COUNTED	AVERAGE NO. OF LARVAE ALIVE	AVERAGE NO. OF LARVAE DEAD	PERCENTAGE MORTALITY
POP 300mg/ml Chlorfenvinphos and 30mg/ml of α-Cypermethrin	0.075/0.0075	60	00	60	00
	0.15/0.015	60	00	60	00
	0.3/0.03	60	00	60	00
	0.6/0.06	60	00	60	00
	1.2/0.12	60	00	60	00
OP 1000mg/ml Chlorfenvinphos	0.125	60	00	60	100
	0.25	60	00	60	100
	0.5	60	00	60	100
	1.0	60	00	60	100
	2.0	60	00	60	100
Amitraz 125mg/ml	0.531	60	39	21	35
	1.062	60	37	23	38.3
	2.124	60	33	27	45
	4.248	60	18	42	70
	8.496	60	06	54	90
Control (Diluent)	2:1 mixture of Chloroform and Olive oil	60	60	00	00

Graphs showing % mortality of larvae against different concentrations of acaricides



Key: Delta 1 &2=Deltamethrins, OP=Chlorfenvinfos, Cyp=Cypermethrin, EC=Effective concentration





CONCLUSION

This preliminary study provides initial evidence that *Boophilus* ticks are resistant to synthetic pyrethroids and Amitraz in some farms. However, depending on the history of acaricide use on a particular farm, organophosphate based formulations could be used for controlling such synthetic pyrethroid resistant Boophilus ticks.

Our next plan

1. A countrywide research together with other stakeholders (actors) for mapping out the distribution and establishing the molecular basis of the acaricide resistance. This will also include other tick species.
2. To develop participatory technology for overcoming acaricide resistance in affected farms.
3. Sensitize the key stakeholders on the findings for appropriate planning

Challenges: Lack of financial resources and limited laboratory capability to handle large scale research on acaricide resistance.

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