FIELD EVALUATION OF THE BIOEFFECTIVITY OF CARBATIX® 85 S WP AGAINST CATTLE TICKS UNDER NATURAL INFESTATIONS IN THE TRANSMARA WEST SUB-COUNTY OF KENYA


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1.1 Introduction

• Carbatix® 85 S WP is based on carbaryl at 850 g/Kg

• Carbaryl is the common name for the chemical 1-naphthyl N-methylcarbamate (EPA 1993)

• It belongs to a group of pesticides called carbamates (Tomlin 2000)

• It’s a broadspectrum pesticide that has been used to control various ectoparasites of animals and humans (Schulze et al. 1992, Hoelscher et al. 1994, Burridge et al. 2002, Downs et al. 2002)

• It’s been used widely to control *R. (Bo.) microplus* in many countries including Zambia, India, Jamaica, New Calendonia and Indonesia (Rawlins and Mansigh 1978, Sharma and Gupta 1982, Brun et al 1984, Basu and Halder, 1994) as well as the blue tick *R. (Bo.) decoloratus (Koch)* infesting cattle (Mathewson and Wilson 1976)

• Also used for control of small ruminant’s, pet and poultry pests - fleas and lice
1.2 Carbatix® 85 S WP Trial Objectives

• to specifically assess the therapeutic efficacy and ability of Carbatix® 85 S WP to control high infestations of *Rhipicephalus appendiculatus* (Neumann, 1901), ‘the brown ear tick’ as well as other tick species under the prevailing natural local conditions of Kenya using the manufacturer’s proposed field usage rate of 2030 ppm or 0.2% at the Kenyan treatment regimen – weekly use

• trials performed to satisfy the requirements of the Cattle Cleansing Act (CAP 358) and the PCPB Act (CAP 346 by the Central Vet Laboratories - Kabete under monitoring by the Director of Veterinary Services Vector Control Products’ Technical Group and the Pest Control Product’s Board (PCPB)

• to have Carbatix® 85 S WP gazetted and possibly registered for tick control in Kenya if it performs (during a test of equivalence) as well as or better than Steladone 300 EC, the only available registered Acetylcholinesterase Inhibitor Ixodicide in the Kenyan market
2.1 Materials and Methods.

• The local agent of the Registrant identified a suitable trial site at Mr. Samson Kisasi’s Olosentu farm in Olosentu Sub-location, Olomismis Location, Kilgoris Division of the Transmara West Sub-County in the Narok County of the Republic of Kenya.

• High tick loads obtainable: 150-250 adult ticks per animal pre-treatment with ¾ being *Rhipicephalus appendiculatus* and *theileriosis* endemic.

• Other tick species present include *A. variegatum/gemma, Rhipicephalus (Boophilus) decoloratus, Rhipicephalus evertsi* and *Hyalomma spp.*

• Infrastructure – cattle crush and adequate cattle enclosures (Bomas).

• Also provided a legal agreement indemnifying the DVS, PCPB and providing for disease diagnosis and treatment of clinical cases besides compensation for cattle in case of disease or accident.
2.2. Trial lay-out and procedures.
Pre-Trial cattle Selection.

- **50 pre-trial cattle selected** on 09/12/2014, identified by ear tagging, vaccinated against FMD (Fotivax), BQ, Anthrax and de-wormed.

- Isolated to own boma and herded separately but not sprayed with a tickicide for 3 weeks under the care of a herdsman, watchman at night and a supervisor.

- A Veterinarian and a Livestock Health Assistant/Technologist were engaged for clinical care.

- Mineral supplements were provided *ad libitum*

- **Tick load verification** done on 24/12/2014. Majority (26 out of 30 cattle which were examined) had the required 150-250 adult ticks.
2.3 Trial Initiation

- Whole body tick counts were performed in situ on day -1 pre-treatment on the aforementioned 50 cattle
- Counts used to rank the animals- from one with highest to one with lowest tick numbers
- 21 experimental animals having moderate tick numbers selected and systematically allocated to 3 treatment groups of 7 animals each i.e negative control, Test and positive control groups.
- Carbatix® 85 S WP was tested at the recommended Field Usage Rate of 2030 ppm as a Hand spray wash in comparison with Steladone® 300 EC at the gazette FUR of 500ppm as the Reference tickicide. Its registered for tick control in Kenya
- Carbatix® 85 S WP is carbaryl based. Sevin® 85 S WP is the only similar product registered for tick control in Kenya but not available since the early 2000.
- Steladone® 300 EC, a chlorfenvinphos-based E.C acaricide is the only related registered acaricide. Chosen due to having same mode of action as the test acaricide i.e both are acetylcholinesterase inhibitors.
- Both used briefly before moving to amitraz-based acaricides
2.4. Application of the acaricide.

- Each Test treatment animal was sprayed with 9 liters of freshly made Carbatix® 85 S WP while those in the Reference Treatment group were sprayed with 10 liters of freshly made Steladone acaricidal wash using a Hobra Rocker Pump fitted with twin hoses and adjustable double spray cone nozzles.

- Spraying was done once every 7 days for a duration of 4 weeks

- Thorough cleaning of pump and crush in between treatments

- Animals in the negative control treatment group were left unsprayed throughout the four-week experimental period.
2.5 The Hobra Rocker Pump
3.1 RESULTS AND DISCUSSION

- Whole body tick counts were done on all the 3 groups of animals on days 1, 3, 5 and 7 post-spraying (repeated weekly)
- Speciation, sexing and state of feeding of the ticks determined *in situ* on all the 3 treatment groups
- The negative control group was found to have the most ticks feeding to repletion cf to the others
- Engorged nymphs were observed in both treatment groups on days 5 and 7 post-treatment
Fig 1. Tick species contribution over the carbatix® 85 S WP experimental Period

- R. appendiculatus was most abundant: ranged 89.9 - 97.2%
- R. (Bo) decoloratus followed with btn 2.1 - 8.9%
- Amblyomma spp was last: ranged btn 0.7 - 1.9%
- Ticks on negative control group – representative of real picture of population
3.2 Efficacy determination

The tick numbers obtained were used to calculate (efficacy) on these days using the formula of Drummond, Whetstone and Miller (1981) below:

\[
\frac{\text{No. of ticks on control group} - \text{No. of ticks on Treatment group}}{\text{No. of ticks on Control group}} \times 100
\]
3.3 EFFICACY (%) AGAINST THE ABUNDANT TICK SPECIES POST TREATMENT WITH CARBATIX® 85 S WP

*Rhipicephalus appendiculatus*  
*Rhipicephalus (Boophilus) decoloratus*

**FIG 2:** POST-TREATMENT *R. appendiculatus* TICK CONTROL

**FIG 3:** POST-TREATMENT *R. (Boophilus) decoloratus* TICK CONTROL
3.4 OVERALL TICK CONTROL BY EACH OF THE ACARICIDES

- The Carbatix® 85 S WP treatment group carried a slightly higher number of ticks on day 1 post-treatment than the Steladone® 300 E.C animal treatment group but the difference was not statistically (P≥ 0.05) significant.

- It attained an overall therapeutic efficacy of 99.1% compared to 98.5% for Carbatix® 85 S WP for day 1 i.e had a better tick knockdown effect.

- Carbatix® 85 S WP however, attained better overall efficacies of 97.9%, 90.2% and 77.4% compared to 91.4%, 76.6% and 58.1% for Steladone® 300 EC on days 3, 5 and 7 post-treatment-attributed to its better performance against *R. appendiculatus*, the most abundant in the tick population.
### 3.5 Total Numbers of Engorged Nymphs Per Treatment Group Post- Acaricide Spraying

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Day 5</th>
<th>Day 7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WEEK 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbatix® 85 S WP</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Steladone® 300 EC</td>
<td>25</td>
<td>249</td>
</tr>
<tr>
<td><strong>WEEK 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbatix® 85 S WP</td>
<td>3</td>
<td>54</td>
</tr>
<tr>
<td>Steladone® 300 EC</td>
<td>32</td>
<td>348</td>
</tr>
<tr>
<td><strong>WEEK 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbatix® 85 S WP</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Steladone® 300 EC</td>
<td>42</td>
<td>359</td>
</tr>
<tr>
<td><strong>WEEK 4</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbatix® 85 S WP</td>
<td>11</td>
<td>156</td>
</tr>
<tr>
<td>Steladone® 300 EC</td>
<td>32</td>
<td>334</td>
</tr>
</tbody>
</table>

- Engorged *R. appendiculatus* nymphs were observed and enumerated on days 5 and 7.
- Nymphs feeding on ECF sick animals drop and moult.
- Resulting adults infective – and will transmit the disease.
- The Steladone® 300 E.C animal treatment group always harbored more engorging/engorged nymphs than the Carbatix® 85 S WP treatment group.
Conclusion and Recommendation.

- Neither the test nor the reference acaricide attained the originally required minimum pre registration tick control efficacy benchmarks of between 99%, 96% and 94% for organophosphate or chlorfenvinphos-based Ixodides in Kenya on days 3, 5 and 7 post-spraying due to emerging resistance by the *Rhipicephalus (Boophilus) decoloratus* population in the area (Lab results).

- Carbatix® 85 S WP was however found to be equivalent in tick knock-down to Steladone® 300 E.C but clearly superior in performance (therapeutic efficacy and repellent action) against both adult and immature *Rhipicephalus appendiculatus* (Neumann, 1901) ticks than Steladone® 300 E.C while the latter was more efficacious against *Rhipicephalus (Boophilus) decoloratus* (Koch, 1844) ‘the blue tick’.

- Carbatix® 85 S WP will therefore offer more satisfactory control of high infestations of both adult and immature *Rhipicephalus appendiculatus* and other tick species infesting cattle when applied once weekly compared to Steladone® 300 E.C.

- On this strength then, the acaricide was gazetted for tick control in the country as a hand spraywash at the tested usage rate.
5.0 Acknowledgements

- We wish to acknowledge the past work of W.J. Roulston, R.H. Wharton and J. Nolan of CSIRO and Dr. Rinkanya, F. G formerly of the Central Veterinary Laboratories-Acaricide Laboratory, Kabete who were responsible for much of the work behind development of the study protocol used in this work.

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- The Director of Veterinary Services for allowing this presentation

- All of you for listening to me
Thank you!