

Rotenoid content and *in vitro* acaricidal activity of *Tephrosia vogelii* leaf extract on the tick *Rhipicephalus appendiculatus*

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1. INTRODUCTION

Acaricidal compounds that are currently used in tick control for livestock in Democratic Republic of Congo (DRC) are very expensive, particularly in Eastern part of the DRC where most farmers are resource poor because of the war. Also current attitudes concerning food safety and environmental quality have raised the general public's interests in using alternative (non-synthetic pesticide) pest controls methods that are not highly toxic to the ecosystem. *Tephrosia vogelii* chemotype 1 (C1) white flowers (TVW) and purple flowers (TVP) varieties (2) constitute the plants with this potential. The aim of the present study was to determine the rotenoid contents of leaf extracts of TVW and TVP and to evaluate their *in vitro* acaricidal activity on the tick *Rhipicephalus appendiculatus*, one of the main ectoparasites of cattle in Eastern of DRC.

2. MATERIALS AND METHODS

2.1. Plant material and rotenoid contents

Leaves from TVW and TVP were collected in May 2011 in North-Kivu Province, DRC at an altitude of 1825 m a.s.l (29°15,153' East - 0°07,117' North) and were left to dry. The powdered plant material (around 1.0g) was extracted with 100 mL of 95% ethanol by percolation technique. Rotenoid contents were identified by the high performance liquid chromatography (HPLC) analysis.

2.2. Tick collection and *in vitro* acaricidal activity

The tick *R. appendiculatus* were collected in May 2011 from bovines naturally infected in North-Kivu at an altitude of 1916 m a.s.l. (29°19' East - 0°05' North). Batches of 20 living adult ticks of both sexes were immersed for 15 minutes in 6 doses of each plant (0.625; 1.25; 2.5; 5; 10 and 20 mg of leaves / mL distilled water) and were transferred to plastic Petri dishes. Amitraz 12.5% (as a positive control), 9.5% ethanol and distilled water control were included. The viability of each batch was recorded every 24 hours for 5 days.



2.3. Statistical analysis

The comparison of the mortality rates of ticks between treatments was made by means of a test of Welch. The lethal dose 50 (LD₅₀) of ticks was determined according to the method of Finney (1).

3. RESULTS

Leaves of TVW had a higher content of rotenoids (1.18%) when compared to TVP (0.67%) (Table 1). However, the dose response relationship determined at the fifth day after treatment showed a similar acaricidal effect with similar LD₅₀ of 0.83 and 0.81 mg /mL for TVW and TVP respectively.

Table 1: HPLC analysis and the *in vitro* acaricidal efficacy of *T. vogelii* leaf extracts on the adults of *R. appendiculatus*

Treatments	Doses ^a	Cumulative numbers of dead ticks after exposure				
		Day 1	Day 2	Day 3	Day 4	Day 5
TVW : rotenone (0.044%, m/m)  deguelin (1.134%, m/m)	0.625	8	8	9	9	9
	1.25	12	13	15	15	15
	2.5	13	14	19	19	19
	5	15	19	19	19	19
	10	17	19	19	19	20
	20	20	20	20	20	20
TVP : rotenone (0.014%, m/m)  deguelin (0.655%, m/m)	0.625	5	7	8	8	9
	1.25	10	13	14	14	15
	2.5	15	15	17	18	19
	5	19	19	19	19	19
	10	19	19	19	19	19
	20	19	19	20	20	20
Positive control (Amitraz)		18	18	19	20	20
Ethanol 9.5%		10	12	14	14	14
Distilled water		2	2	3	3	3

^a mg of dried leaves / mL distilled water

4. DISCUSSION AND CONCLUSION

Although the LD₅₀ of both varieties of *T. vogelii* were similar, the leaves of TVW were shown to contain higher amounts of rotenoid compounds than TVP. It could be recommended to use in priority the white one. However, seasonal collections should be analyzed before coming to the conclusion that the differences in concentration of rotenoids are significant between the two plants. It is concluded that *T. vogelii* leaves (C1) may be used for the control of *R. appendiculatus* in areas where synthetic acaricides are either not available or affordable. However, *T. vogelii* extract should be sprayed in order to limit the potential risks of ecotoxicity linked to rotenoid compounds.

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