Kasetsart J. (Nat. Sci.) 35 : 34 - 39 (2001)

Effect of *Tamarindus indicus* L. Against the *Boophilus microplus*

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ABSTRACT

The crude-extract of *Tamarindus indicus L.* with water and 10% ethanol in water were tested the acaricidal activity on the engorged female cattle tick (*Boophilus microplus)* by dipping method. The mature tamarind fruits taking off the seeds were extracted by water or 10% ethanol in the ratio of 1:2 and 1:5 W/V for 7 days. The corrected mortality of the ticks were observed after dipping at 24 h, 48 h and 7 days. The mean of corrected mortality of ticks of these 4 crude-extracts of tamarind fruits were 56-70 %, 70-89% and 77-99% by no statistically significant different after dipping at 24 h, 48 h and 7 days, respectively. The organic acids in tamarind fruits (oxalic, malic, succinic, citric and tartaric acids) were also bioassayed the acaricidal activity by dipping method. The oxalic acid of 0.5% and 1% concentration exhibited the highest acute acaricidal activity (56% and 62% mortality of ticks at 24 h after dipping, respectively). The tartaric acid 1% concentration showed the highest delayed acaricidal activity (73% mortality of ticks at 7 days after dipping). The mixture of 0.5% of oxalic acid with 0.5% of malic, succinic, citric and tartaric acids by concentration of 1:1 V/V were tested the acaricidal activity. The acaricidal activity of these acid mixtures were not more stronger than those of each individual acid. Both of crude-extract of tamarind fruits and their organic acids caused the patchy hemorrhagic swelling on the skin of ticks after dipping at 15 min.

This indicates that the crude-extract of tamarind fruits by water or 10% ethanol is possibly use in practical for controlling the tropical cattle tick. The active substances are their organic acids, especially oxalic and tartaric acids.

Key words: tamarind fruits, crude-extracts, acaricide, tropical cattle ticks

INTRODUCTION

Since the synthetic acaricides are delayed degradation, they are remain residue in agricultural environment and induce resistant strains of ticks. The tropical cattle ticks (*Boophilus microplus*) also can develop resistant strains against the synthetic acaricides (Drummond, 1977; Howell, 1977). Therefore, the direct application of the effective natural plant crude-extracts are highly demand to substitute the synthetic acaricides. Our screening of larvicidal and acaricidal activities of the ethanol crude-extracts on *Boophilus microplus* showed many plant crude-extracts will be use to substitute the synthetic acaricides. The high larvicidal activity plants were *Acanthus ebracteatus* Vahl., *Acorus calamus* L., *Anomianthus dulcic, Annona squamosa* L., *Homalomena aromatica* Schott., *Kalanchoe pinnata* Lamk., *Luffa acutangula* Roxb., *Moringa oleifera* Lamk., *Oxalis repens* Thunb., *Pachyrrhizus*

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erosus L., *Rhinacanthus nasutus* Kurz., and *Stemona collinsae* Craib. (Chungsamarnyart *et al*. 1988 and 1991a). The acute high acaricidal activity plants were *Annona squamosa* L., *Calotropis gigantea* R.Br. and *Streblus asper* Lour. (Chungsamarnyart *et al.*, 1990 b; 1991 b). The volatile oils of citrus peel, lemon and citronella grasses also showed high larvicidal and acaricidal activities (Chungsamarnyart and Jiwajinda, 1992; Chungsamarnyart and Jansawan, 1996). The plants species showed high anti-laying activity on female ticks were *Aganonerion polymorphum* P.S., *Annona muricata* L., *Calotropis gigantea, Pachyrrhizus erosus* L., *Polyscias balfouriana* B., *Prema latiforia* Roxb. and *Thunbergia erecta* T. Anders (Chungsamarnyart *et al.,* 1991a). Some of these plants can be the practical use; *Annona squamosa* L. seeds (Chungsamarnyart *et al.,* 1991 c), volatile oil from lemon and citronella grasses (Chungsamarnyart and Jiwajinda, 1992); *Pachyrrhizus erosus* L. seeds (Chungsamarnyart and Jansawan, 1993), and citrus peel oil (Chungsamarnyart and Jansawan, 1996). Some plant crude-extracts exhibited the synergistic activity with the several other plant crude-extracts. One of them was the leaves of *Aganonerion polymorphum* Pierre ex Spire (Chungsamarnyart and Jansawan, 1994) which during allowing the leaves to be dry, it has similar odor as the mature tamarind fruits. Therefore, the acaricidal activity of the crude-extracts of the mature tamarind fruits and their containing organic acid (Hasan *et al.,* 1978) were bioassayed to find out the effective concentration of crude-extracts and the active substances.

MATERIALS AND METHODS

The mature tamarind fruits (*Tamarindus indicus* L.) taking off the seeds were immersed in water and in 10% ethanol in the ratio of 1:2 and 1:5 W/V for 7 days. Each of crude-extracts were tested the acaricidal activity on the engorged female cattle ticks (*Boophilus microplus*) by dipping method. The organic acids containing in tamarind fruits; oxalic, malic, succinic, citric and tartaric acids were also bioassayed the acaricidal activity. These organic acids were tested at 0.5% and 1% concentration. The organic acid that showing the highest acaricidal activity was mixed with the other acids by 1:1 V/V of 0.5% concentration and tested the activity. The control groups were dipping with water or 10% ethanol. The mortality of ticks were observed at 24 h, 48 h and 7 days after dipping (Chungsamarnyart *et al.,* 1990 a). The corrected mortality of ticks calculated by Abbott's formula (Abbott, 1925). The mean (%) of corrected mortality were average of 5 replications (20 engorged female ticks/ replication).

RESULTS

Both of the tamarind crude-extracts with water and 10% ethanol were showed the mean corrected mortality of the adult ticks with non statistical significant different at 24 h, 48 h and 7 days after dipping (Table 1). The crude-extracts of tamarind:water, 1:2 and 1:5 W/V exhibited the 99% and 77% mortality of ticks at 7 days after dipping, respectively. The two crude-extracts of tamarind:10% ethanol, 1:2 and 1:5 showed 91% and 87% mortality of ticks at 7 days after dipping, respectively (Table1). All of these crude-extracts of tamarind fruits caused patchy hemorrahagic swelling on the tick's skin at 15 min after dipping (Fig. 1, arrows). The tick of control groups normally laid the numerous eggs after dipping 3 days (Fig.2, left petri dish)

Among the acaricidal activity of organic acids containing in tamarind fruits, the oxalic acids of 0.5% and 1% concentration exhibited the highest acute acaricidal activity (56% and 62% mortality of ticks at 24 h after dipping, respectively). The tartaric acid 1% concentration showed the highest delayed acaricidal activity (73% mortality of ticks at 7 days after dipping, Table 2). The mixture of equal volume of 0.5% oxalic acid with the other acids were

Table 1 Effect of the crude-extracts of tamarind fruits against the engorged female of the *Boophilus* microplus.

Tamarind fruit & solvents	Concentration (W/V, 7 days)	Corrected mortality (Mean, %)[1]		
		24 h[2]	48 h[3]	7 days[4]
Tamarind fruits + water	1:2	70 ns	89 ns	99 ns
	1:5	56 ns	70 ns	77 ns
Tamarind fruits + 10% ethanol	1:2	69 ns	76 ns	91 ns
	1:5	68 ns	75 ns	87 ns

1, Mean (%) of 5 rep. (20 ticks/rep.); 2, C.V. 14.33%; 3, C.V. 17.14%; 4, C.V. 13.40%; ns, non statistically significant at 95% level.

Table 2 Effect of organic acids in tamarind fruits against the engorged female of the *Boophilus microplus*.

Organic acids	Concentration (%)	Corrected mortality (Mean, %)[1]		
		24 h[2]	48 h[3]	7 days[4]
Oxalic acid	1 %	62 a	66 a	67 ab
	0.5 %	56 a	66 a	70 a
Malic acid	1 %	3 b	36 b	55 bc
	0.5 %	2 b	14 ef	23 ef
Succinic acid	1 %	4 b	29 bc	44 cd
	0.5 %	2 b	4 f	11 f
Tartaric acid	1 %	4 b	26 bcd	73 a
	0.5 %	1 b	19 cde	37 d
Citric acid	1 %	4 b	16 de	24 e
	0.5 %	0 b	14 ef	22 ef

1, Mean (%) of 5 rep. (20 ticks/rep.); 2, C.V. 45.22%; 3, C.V. 29.36%; 4, C.V. 23.50%; values with the different letters in the same column are statistically significantly different.

bioassayed for elucidation the synergistic acaricidal activity (Table 3). The comparing with Table 2, these acid mixtures were not exhibited the higher acaricidal activity than that of the oxalic acid only. All of pure and the mixtures of these organic acids also caused pathy hemorrhagic swelling on the ticks's skin at 15 min as the same as the crude-extracts of tamarind fruits

DISCUSSION

The acaricidal activity of the crude-extracts of tamarind fruits had no previous reported. There are only the reports of the antinematode on *Meloidogyne incognita*, the antifungal activities on *Ustilago hordei* and *Ustilago tritici* and the antibacterial activity on *Xanthomonas campestris pv. Campestris* (Grainge and Ahmed, 1988). This acaricidal activity bioassay showed that both of tamarind crude-extracts with water and 10% ethanol

by 1:5 W/V and 1:2 W/V exhibited the mortality of the adult ticks with non statistical significant different at 24 h, 48 h and 7 days after dipping (Table 1). This variable mortality rate might be depend on the duration of wet crude-extracts contacting with tick's skin. Therefore, this result demonstrated that the crude-extracts of tamarind fruits with water or 10% ethanol at 20% concentration (1:5 W/V) are possible to use for controlling the cattle ticks by 2-3 repeated spray for increasing the contacting time of crude-extract on the tick.

Figure 1 The engorged female of the *Boophilus microplus* show the patchy haemorrhagic swelling lesion on the skin (right petri dish, arrows,) at 15 min after dipping with 10% ethanol extracted tamarind fruits (tamarind fruits:10% ethanol, 1:5 W/V), and the control ticks (left petri dish).

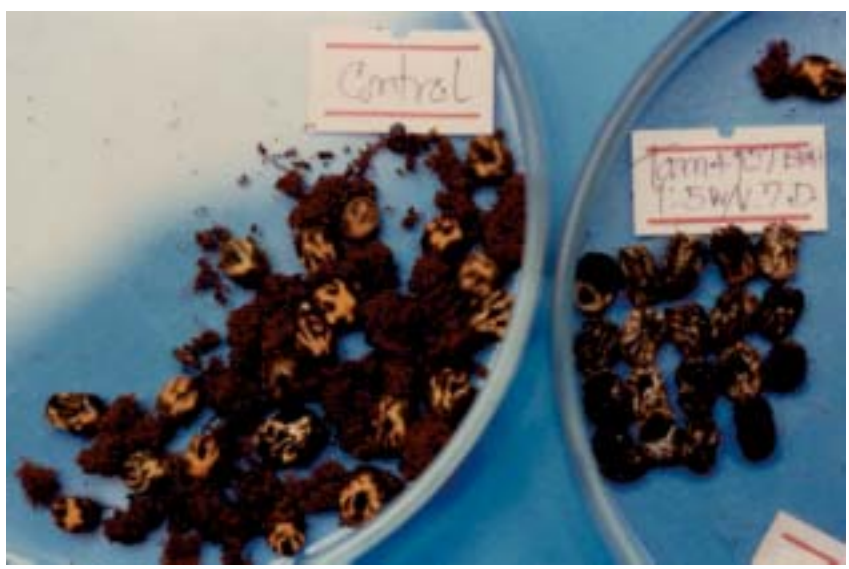

Figure 2 The engorged female of the *Boophilus microplus* show numerous laying the eggs in control group (left petri dish) and dried shrinkage of dead ticks at 7 days after dipping with 10% ethanol extracted tamarind fruits (tamarind fruits:10% ethanol, 1:5 W/V), right petri dish).

Table 3 Effect of combination of organic acids against the engorged female of the *Boophilus* microplus.

Organic acids	Concentration	Corrected mortality(Mean,%)[1]		
	(1:1,V/V)	24h[2]	48h[3]	7days[4]
Oxalic acid+Malic acid	0.5% + 0.5%	44 a	48 a	54 ab
Oxalic acid+Succinic acid	0.5% + 0.5%	25 b	39 ab	49 b
Oxalic acid+Tartaric acid	0.5% + 0.5%	30 b	51 a	62 a
Oxalic acid+Citric acid	0.5% + 0.5%	27 b	27 b	31 c

1, Mean (%) of 5 rep. (20 ticks/rep.); 2, C.V. 32.46%; 3, C.V. 24.99%; 4, C.V. 16.05% ; values with the different letters in the same column are statistically significantly different.

All of the tamarind fruits crude-extracts (Table 1) and five organic acids as containing in tamarind fruits (Table 2) caused the same patchy hemorrhagic swelling on the tick's skin at 15 min after dipping (Fig 2, right petri dish). This lesion might be showed that the active acaricidal substances in tamarind fruits are their organic acids. Especially the oxalic acid and tartaric acids since they caused high acute and high delayed mortality of ticks, respectively (Table 2). The acaricidal activity of the mixture of the oxalic acids with the other organic acids were not more increased than that of oxalic acid only. (Table 2 and Table 3). It exhibited that this five organic acids might be not synergistic acaricidal activity with each other. Therefore, the major active acaricidal substances in the crude-extracts of the tamarind fruits were oxalic and tartaric acids.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the Kasetsart University Research and Development Institute for the research fund.

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Received date : 10/01/01
Accepted date : 30/03/01