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Efficacy of Certain Essential Oils and Insect Repellents Against Land Leeches

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Abstract. Relative efficacy of six essential oils, viz., Cinnamon, Citronella, Eucalyptus, Orange, Pine, Spearmint and four insect repellents i.e, Dimethyl phthalate (DMP), Dibutyl phthalate (DBP), Expel and My101 was investigated against land-leeches, ***Haemadipsa zeylanica montivindicis*** Moore, under laboratory conditions. Cinnamon oil was found to be the best among the essential oils and out of repellents, My101 and DMP were effective equally.

1. Introduction

Protection against land leeches has always been a problem for military and paramilitary forces posted in north eastern region of India. Chemical control of leeches has a very restricted use due to rough terrain and thick forests. Use of repellents appears to be the only safe defensive method against leech bite.

In India, no repellent effective against leeches, is commercially available. Dixit et *al*[1] found that oils of Citronella, Cinnamon, 1:1 mixture of Acorus oil + haldi oil and 1:1 mixture of Acorus oil + synthetic pine oil were effective for 5-6 hours. Saxena et *al*[2] reported the insecticidal and repellent properties of the seed extract of ***Tephrosia purpurea*** against land leeches and other insects of public health importance. Some other workers have studied commonly available repellents and certain synthetic chemicals against land and water leeches[3-5].

This paper deals with the laboratory screening of six essential oils and four insect repellents against land leeches, ***Haemadipsa zeylanica montivindicis*** Moore.

2. Materials and Method

2.1 Repellent

The essential oils, viz., Cinnamon, Citronella, Eucalyptus, Pine and Spearmint were obtained from the trade. Orange oil was obtained through steam distillation of orange

peels. Dimethyl phthalate (DMB) and Dibutyl phthalate (DBP) were procured from Army sources. Mylol* and Expel**, commercially available insect repellents, were obtained from the trade.

2.2 Test Leeches

Leeches were collected from their natural habitat, viz., forests and marshy lands of Bhalukpong, situated at a distance of about 50 km from Tezpur. Test leeches were identified and found to be ***Haemadips a zevlanica montivindicis*** Moore. These were maintained in the laboratory in specially designed cages[1,6].

2.3 Experimental Procedure

The repellency was tested as per Ribbands[7] method modified by Ramachandran *et al*[8] and followed by others[3-4]. A set of four cloth strips (size 12.5 cm x 32.5 cm) tied with rubber bands on glass panels, were used for one particular concentration. For each concentration, ten leeches were used, one at a time, in the square within the barrier. All the leeches used in a test, were from one field collection, to reduce variation to the minimum.

The room, where studies were undertaken, was maintained at 27 $\pm$ 1°C and RH 70 $\pm$ 5 percent.

3. Results and Discussion

Leeches probe the surface of the host body, before settling for sucking blood, The index of repellency, was, therefore, based on the number of probes repelled. This was calculated for different concentrations of all the oils and insect repellents tested. As the repellents were incorporated in the cloth strips, the various concentrations were calculated on gms/cm^2 basis.

Based on the percentage of attempts repelled, Cinnamon oil was found to be the best followed by oils of Spearmint, Pine, Citronella, Eucalyptus and Orange (Table 1). Even 25 percent concentration of Cinnamon oil repells cent per cent leeches. Among the insect repellents (Table 2), DMP and My101 were chemicals of choice. DBP was found to be the least effective.

In earlier studies using different methodology, it was observed that Cinnamon and Citronella oils were effective for 5 to 6 hours, while DMP only for 2-3 hours'. Both these oils were very much persistent in repellency against land leeches, when applied on drill[9] OG. DMP has always been found better than DBP in laboratory and field trials as well as in persistence[1,9]. Among the commercially available repellents, My101

Manufactured by :- *M/S The Boots Company (India) Ltd., Bombay-400038.
**M/S Balsara Hygiene Products, Bombay-400023.

Table 1. Relative repelleney of certain oils against land leeches

Oil	Concentration (%)	Quantity of oil used per Cm^2 (in gm)	Total crossings and attempts	Percentage of attempts repelled
Cinnamon	10	0.00189	*2 in 74 (114)	97
	25	0.00472	0 in 80 (109)	100
	50	0.00944	0 in 102 (133)	100
	100	0.01889	0 in 77 (109)	100
Citronella	10	0.00166	7 in 78 (132)	91
	25	0.00415	5 in 58 (106)	91
	50	0.00831	3 in 82 (147)	96
	100	0.01662	2 in 108 (161)	98
Eucalyptus	10	0.00167	7 in 92 (128)	92
	25	0.00418	5 in 107 (152)	95
	50	0.00836	3 in 96 (127)	97
	100	0.01673	3 in 107 (135)	97
Orange peel	10	0.00164	10 in 78 (124)	87
	25	0.00409	10 in 63 (105)	84
	50	0.00818	10 in 78 (132)	87
	100	0.01636	5 in 87 (154)	94
Pine	10	0.00162	8 in 71 (114)	89
	25	0.00405	7 in 95 (150)	93
	50	0.00810	0 in 78 (118)	100
	100	0.01619	0 in 88 (126)	100
Spearmint	10	0.00181	6 in 96 (137)	94
	25	0.00452	4 in 78 (110)	95
	50	0.00904	0 in 91 (120)	100
	100	0.01807	0 in 67 (115)	100

* Leeehes made 74 total attempts in which two were successful and where head sucker touched the impregnated cloth 114 times.

Table 2. Relative efficacy of insect repellents against land leeches

Repellent	Concentration (%)	Quantity of repellent used per Cm^2 (in gm)	Total crossings and attempts	Percentage of attempts repelled
DMP	10	0.00230	9 in 69 (124)	87
	25	0.00576	7 in 94 (123)	93
	50	0.01151,	5 in 70 (125)	93
	100	0.02303	1 in 49 (97)	98
DBP	10	0.00198	10 in 62 (130)	84
	25	0.00494	10 in 67 (99)	85
	50	0.00989	10 in 53 (124)	81
	loo	0.01977	10 in 57 (96)	82
Mylol	10	0.00204	8 in 86 (124)	91
	25	0.00509	6 in 83 (107)	93
	50	0.01018	3 in 80 (121)	96
	100	0.02036	2 in 95 (134)	98
Expel	10	0.00203	10 in 34 (80)	71
	25	0.00509	10 in 29 (74)	66
	100	0.02034	5 in 66 (112)	92

(constituents-DMP (B.P.)-59.5% + DBP (I.P.)—40% + Terpentine oil (B.P.C.)—0.5%) was the best. My101 has also been found effective against Simuliids (black-flies)[10].

The present observations may serve as base line data to other workers.

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