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Response of Tabanidae (Diptera) Species to Malaise Traps Baited with 1-octan-3-ol and 4-methylphenol

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ABSTRACT

Natural and synthetic attractants have been widely used for controlling horse fly populations. Relative responses of horse fly species to different attractants may vary under the different environmental conditions in different geographical areas. Many studies reported that, octanol and methylphenol are effective attractants for horse fly species and when they were combined with phenolic compounds together, their attractant effect increased. In this study we examine the effectiveness of Malaise traps baited with octenol and methylphenol on tabanids species in the province of Eskişehir, Çatacık Forests and Hekim Mountain in Turkey. As a result, a total of 3045, 1428 and 626 specimens were caught with the trap baited with octanol, methylphenol and the control trap, respectively. The results of this study are compared and evaluated with the results of previous studies performed with natural and synthetic attractants in different geographical regions. The results obtained demonstrated that, octanol and methylphenol can be used effectively for controlling horse flies in this part of Turkey.

Key words: Tabanidae, Octanol, Methylphenol, Diptera, Turkey.

INTRODUCTION

Recently, 3 subfamilies, 167 species belonging 9 genera and 14 subspecies of horse flies were reported in Turkey (Kılıç, 2006; Andreeva *et al*., 2009; Altunsoy and Kılıç, 2010). The number of known species in Palearctic region is approximately 660 (Chvála, 1988).

The female tabanids during the blood-feeding period frequently change hosts between wild and domestic animals, and for that reason they are potential mechanical vectors for the diseases caused by viruses, bacteria and protozoans (Chvála *et al*., 1972). Due to this behavior, their importance in terms of medical and veterinary issues is extremely high. Also, they may cause drastic reductions in yields of milk and meat due to the pain and molestation that they cause during the blood-feeding (Chvála *et al*., 1972).

In the temperate Europe, the adult tabanids attack the animals during 4-5 months in a year. Adult females are compulsory blood feeders and they require to blood-feeding before egg laying (Krcmar *et al*., 2002). Perich *et al* (1986) reported that a cattle attacked by average of 66 tabanids daily had daily loss of 0.1 kg of milk. In the studies performed with 500 cattle used for animal husbandry in Louisiana, daily yields of the animals attacked by Tabanidae was reduced by 1-2% (Leprince *et al*., 1991).

Therefore, reducing the pressure of mature individuals on farm animals is extremely important in the economic terms.

The use of synthetic attractants for keeping Tabanidae populations under control by increasing sample and the number of species caught in traps is useful in order to monitor and control certain species (Nilssen, 1998). Until today, there are no adequate methods developed for controlling the Tabanidae species (Barros and Foil, 2007)., It was reported that, synthetic and natural attractants are effective for controling Tabanidae species (Krcmar *et al*., 2009). Efficiency of traps can be increased when they are baited with synthetic attractants that mimic natural host odors, but it is known that different tabanidae species will react differently (Hall and Wall, 2004).

It has been observed that synthetic attractants such as carbon dioxide, 1-octane-3-ol, ammonia, mixtures of ammonia and 1-octan-3-ol, 3-methylphenol and 4-methylphenol increased the number of individuals caught by traps (Roberts, 1975; Long and French, 1988; French and Kline, 1989; Hribar *et al*., 1992; Hayes *et al*., 1993; Amsler and Filledier, 1994; Nilssen, 1998; Gibson and Torr, 1999; Mohamed-Ahmed and Mihok 1999; Kristensen and Sommer, 2000; Downer and Stoffolano, 2006; Krcmar, 2007; Mihok *et al*., 2007). In addition, it was observed that, natural attractants such as urine of African buffalo, rhino, cows, horses, sheeps and pigs have phenolic compounds attract many Tabanidae species (Madubunyi *et al*., 1996; Mihok *et al*., 1996; Krcmar *et al*., 2005, 2006, 2009).

In this study we examined the efficiency of 1-octen-3-ol and 4-methylphenol, that are known as excellent attractants, to tabanidae species which are occurring in Eskişehir.

MATERIALS AND METHODS

The study was conducted in two different regions: Eskişehir Çatacık Forests (39° 58' 06" N, 31° 07' 53" E 1582 m) and Hekim Mountain region (39° 54'31" N, 30° 33'59" E 1180 m) in 5-20 June and 1-15 July.

Adult tabanids were collected with tree identical Malaise traps. Two traps were baited with 1-octen-3-ol and 4-methylphenol and the third trap was used as control trap without attractant. Traps were arranged with a distance of 100 meters among them. The traps were checked every 20 minutes at 9 am to 7 pm and the total numbers of individuals have been checked.

All trapped specimens were stored on the entomological needles and determined after hydration process in the laboratory in accordance with the literature (Chvála *et al*., 1972; Schacht, 1987; Leclercq, 1966a, 1966b, 1967a 1967b). After determinations, specimens were added to the collections of Anadolu University, Faculty of Science, and Zoology Museum. Leica MZ 12.5 stereo microscope was used for the identifications of the specimens.

The statistical significance of the differences observed in the numbers of specimens collected among the different traps was determined with the ANOVA analysis of the variance, followed by the Turkey post hoc test. All statistical analyses were performed using the IBM SPSS 20.01 (SPSS Inc. 2011).

RESULTS AND DISCUSSION

A total 5153 adult individuals belonging to 16 species and 4 genera were caught during the study. A total of 2657 specimens were collected at Çatacık Forest and 2496 specimens were collected at Hekim Mountain.

In the Catacik Forest the most abundant species were *Tabanus bromius* (35%), *Tabanus lunatus* (31%), *Tabanus miki* (9,33%), *Philipomyia aprica* (6,74%), *Tabanus bifarius* (6,21%) and *Tabanus quatuornotatus* (5,34%) (Table 1). These six species accounted for 93.5% of the total catch. The remaining 10 species made only 6.32% of the total catch. Traps with octanol caught 53,37% of the total catch. Traps with methylphenol caught 34,59%, while control trap caught only 12,04% of the total catch, respectively (Table 1). There were a statistically significant differences in the efficiency among three different traps when compared with each other F = 3.696 p = 0.049 (p ≤ 0, 05).

Table 1. The list of total numbers of horse flies sampled with Malaise traps baited with 1-octen-3-ol and 4-methylphenol in Çatacık Forests.

Species	1-octen-3-ol Trap	4-methylphenol Trap	Control Trap	∑	%
Tabanus bromius Linnaeus 1758	590	250	90	930	35,00%
Tabanus lunatus Fabricius 1794	560	186	75	821	30,90%
Tabanus miki Brauer 1880	153	75	20	248	9,33%
Philipomyia aprica (Meigen 1820)	99	65	15	179	6,74%
Tabanus bifarius Loew 1858	99	50	16	165	6,21%
Tabanus quatuornotatus Meigen 1820	98	32	12	142	5,34%
Chrysops caecutiens (Linnaeus 1758)	22	14	3	39	1,47%
Tabanus spodopteroides Olsufjev, Moucha and Chvala 1969	18	3	3	24	0,90%
Tabanus spodopterus Meigen 1820	11	8	1	20	0,75%
Tabanus cordiger Meigen 1820	10	5	4	19	0,72%
Haematopota subcylindrica Pandelle 1883	6	6	5	17	0,64%
Tabanus glaucopis Meigen 1820	5	5	3	13	0,49%
Tabanus briani Leclercq 1962	8	5	-	13	0,49%
Tabanus unifasciatus Loew 1858	6	3	2	11	0,41%
Tabanus rupium (Brauer 1880)	4	2	1	7	0,26%
Tabanus portschinskii Olsufjev 1937	3	2	-	5	0,19%
∑	**1418**	**919**	**320**	**2657**	
%	**53,37%**	**34,59%**	**12,04%**		

In the Hekim Mountain the most abundant species were *T. bromius* (35,46%), *T. lunatus* (32,73%), *T. miki* (11,94%), *T. bifarius* (6,05%), *P. aprica* (5,81%) and *T. quatuornotatus* (3,13%)(Table 2). These six species accounted for 95,11% of the total catch. Other nine species accounted for less than 5% of the total catch. Traps with octanol caught 65,18% of of the total catch. Traps with methylphenol caught 22.56%

while control trap caught only 12,26% of the total catch (Table 2). There were a statistically significant differences in the efficiency among three different traps when compared with each other. F = 3.768 p = 0.047 (p ≤ 0, 05).

Table 2. The list of total numbers of horse flies sampled with Malaise traps baited with 1-octen-3-ol and 4-methylphenol in Hekim Mountain.

Species	1-octen-3-ol Trap	4-methylphenol Trap	Control Trap	∑	%
Tabanus bromius Linnaeus 1758	550	220	115	885	35,46%
Tabanus lunatus Fabricius 1794	540	170	107	817	32,73%
Tabanus miki Brauer 1880	225	50	23	298	11,94%
Tabanus bifarius Loew 1858	100	40	11	151	6,05%
Tabanus quatuornotatus Meigen 1820	55	15	8	78	3,13%
Philipomyia aprica (Meigen 1820)	95	30	20	145	5,81%
Tabanus spodopteroides Olsufjev, Moucha & Chvala 1969	16	9	7	32	1,28%
Tabanus cordiger Meigen 1820	13	8	4	25	1,00%
Haematopota subcylindrica Pandelle 1883	8	6	4	18	0,72%
Tabanus glaucopis Meigen 1820	11	6	3	20	0,80%
Chrysops caecutiens (Linnaeus 1758)	6	5	2	13	0,52%
Tabanus spodopterus Meigen 1820	3	1	1	5	0,20%
Tabanus unifasciatus Loew 1858	2	1	1	4	0,16%
Tabanus briani Leclercq 1962	2	1	-	3	0,12%
Tabanus rupium (Brauer 1880)	1	1	-	2	0,08%
Tabanus portschinskii Olsufjev 1937	-	-	-	0	0,00%
∑	**1627**	**563**	**306**	**2496**	
%	**65,18%**	**22,56%**	**12,26%**		

In the previous studies many researchers examined the effects of the different types of attractants such as octanol, phenol and acetone on the Tabanidae species (Mizell *et al*., 2002; Mihok *et al*., 2007). Those studies reported that the mixture of octanol and ammonia had both positive and negative effects. However, the mixture of octanol, phenol and acetone was found to have a negative effect (Mihok *et al*.,2007). The use of octanol alone as an attractant had an important effect to increase the number of individuals captured in traps (Krcmar *et al*., 2009).

Octanol is a natural chemical found in the breath of mammals (Hall *et al*. 1984). Therefore it is important for arthropods using chemical stimuli to focus to the host (Krcmar *et al*., 2002; Cilek and Olson, 2008). Many researchers aimed to increase the number of individuals and the species caught by traps by using octanol alone or mixing octanol with various chemicals (Hayes *et al*., 1993; Foil and Hribar 1995; Nilssen, 1998; Krcmar *et al*., 2005; Strawberry and Olson, 2008).

The numbers of individuals caught in traps during the study period were analyzed and statistically significant differences were found. Based on these results, the use of octanol and methylphenol in traps increased the number of individuals captured by traps.

The similar results were reported by Krcmar *et al.,* (2009). Additionally, according to Altunsoy and Kılıç (2012) *T. briani, T. rupium* and *T. portschinskii* activity as very low but, *T. bromius* and *T. lunatus* activity higher than the other species were reported.

Kristensen and Sommer (2000) reported that, the number of individuals of *Haematapota pluvialis* were detected 5 times more in the traps baited with octanol. In Canada, the number of individuals of *Tabanus similis*, *Tabanus quinquevittatus*, *Hybomitra lasiophthalma*, *Chrysops univittatus* and *Chrysops aberrans* species caught by Nzi trap with octanol were about 7.5 times more than the control trap (Mihok *et al*., 2007). In the study conducted in South Louisiana, Hribar *et al*. (1992) reported that, the solution of ammonia-octanol increased the number of individuals which were caught 4.5 times. Moreover, it was reported that the individuals belonging to *H. lasiophthalma* species were detected 2.5 times more in the trap with ammonia solution than the normal trap (Hribar *et al*., 1992). In a similar study using two different chemicals in Croatia, 71.4%, 15.2% and 9% of the total captured adult specimens were obtained from the trap with 4-methylphenol, the trap including 3-isopropilephenol and the control trap, respectively (Krcmar, 2007). In the study of Krcmar *et al*. (2009) that used canopy traps baited by the combination of specific proportions of octanol, acetone and ammonia, 15 times more horse flies were caught than in the control trap. In the same study, it was reported that, aged donkey urine, lactic acid and fresh human urine used with 1-octen-3-ol, acetone and ammonia solution in the proportions 5: 3: 2 have resulted with 12, 4 and 2.5 times more adult Tabanidae caught than by the control trap.

There is no effective method that can be used to control of Tabanidae species and prevent economic losses that they can cause in farms (Hayes *et al*., 1993; Foil and Hribar, 1995; Nilssen, 1998; Krcmar *et al*., 2005; Cilek and Olson, 2008). The different attractants seems to be effective for Tabanidae species in different geographic regions, under different environmental conditions. In addition, it was reported that, natural or synthetic attractants had different effects in different species (Krcmar *et al*., 2002). However, the use of different synthetic and natural attractants in traps in the period that the populations of Tabanidae are the most active is still used as a method to reduce the rate of the attack of Tabanidae. The results of this study prove the efficiency of the octanol as attractant for the Tabanidae species widely distributed in the province of Eskişehir.

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