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The Capture Effect of Yellow Sticky Traps of Different Tones on *Agalmatium bilobum* (Fieber, 1877) (Hemiptera: Auchenorrhyncha: Issidae) in Almond Orchards

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ABSTRACT

This study was conducted to determine the effects of yellow traps of different tones against *Agalmatium bilobum* (Fieber, 1877) (Hemiptera: Auchenorrhycha: Issidae: Hysteropterinae) in almond orchards in Yurtbaşı District of Elazığ Province between May to July of 2018. In this study, planthopper individuals were caught in eight different yellow-toned traps and counted for 14 days. It has been determined that most planthopper individuals were attracted by the yellow color tone with trap codes 1016 (4) and 0279 (5). It is considered that this color tone is mostly effective for the attraction of *A. bilobum* in almond orchards. Accordingly, positive results can be obtained from using this kind of yellow tone trap by the producers to prevent the harm of *A. bilobum* to almonds. To the best of our knowledge, this is the first report related to the capture effect of yellow sticky traps on the Issidae species .

Keywords: Hysteropterinae, planthopper, sticky trap, colour tone, almond, Turkey.

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INTRODUCTION

Almond production is considered to be of great economic importance in Turkey, however, there are many insect species harmful in almond orchards (Bolu, Özgen, & Çınar, 2005). In particular, *Agalmatium bilobum* (Fieber, 1877), a member of the planthopper family Issidae (subfamily Hysteropterinae) was recorded as harmful species in almond and fruit orchards (Bolu et al, 2005; Yayla, Kelten, Davarcı, & Salman, 1995; Tezcan & Zeybekoğlu, 2001; Kovancı, Gençer, Kovancı, & Akgül,2004), although Lodos (1986) did not treat its harm as economically important in Turkey. However, in California (USA) where *A. bilobum* was unintentionally introduced in the middle of the last century (Gnezdilov & O'Brien, 2006), this species harms by their mass egg-laying with abundant mud on grapevine stakes and adjacent telephone poles, trunks and branches of olive trees etc. (Caldwell & DeLong, 1948; Schlinger, 1958; Doering, 1958). In Eastern Europe, *A. bilobum* is recorded as polyphagous species (Logvinenko, 1975; Chumak, 2005). In Georgia, the species of the genus *Agalmatium* Emeljanov, 1971 were recorded as pests of grapevine and fruit trees (Batiashvili & Dekanoidzhe, 1967). In Turkey, another species of this genus, *Agalmatium flavescens* (Olivier, 1791), is harmful to olive trees in Mardin Province (Kaplan, 2019).

Thus *A. bilobum* potentially may be treated as harmful to cultivated plants and accordingly it is important to find methods of population control of this pest without using chemicals. In this study, the catching effect of different yellow color traps against *A. bilobum* was examined.

MATERIAL AND METHODS

The study was carried out in three acres of almond orchards, which were damaged by *Agalmatium bilobum* in Elazığ (Yurtbaşı) Province, Turkey. The emergence of the egg packages of the species on almond trees was monitored and the traps were hung on the trees after March when these packages started to appear. The traps remained on the trees until the end of August. Adult stages of the species caught in the traps were counted. The period when the traps were hung on the trees coincided with the beginning of leafing in almonds and the end of summer. Traps were counted between early July and mid-July, when adult pests are most abundant in nature. This period coincides with the almond fruit harvest. The traps containing eight yellow-colored tones used in the study were hung on the 2 m branches of the trees (Fig. 1). RAL codes of the color tones used in the study are given in Table 1. Planthopper individuals were counted on the sticky traps. Individuals on the trap were taken from the trap after counting. The traps were checked twice a day and the total number was recorded daily. In order to determine the male/female ratio of individuals caught in different color codes, individuals carefully taken from yellow adhesive plates with the help of a fine-tipped needle were brought to the laboratory and examined.

RESULTS

It has been determined that the most number of *Agalmatium bilobum* individuals was matched by the yellow color tone with a trap code of 1016 (4) and 0279 (5) (Fig. 2) Apart from these codes, the trap numbered 1021 showed the effect of attracting the pest. The percentage of male/female ratio of individuals caught in different color codes was determined as 40%/60%.

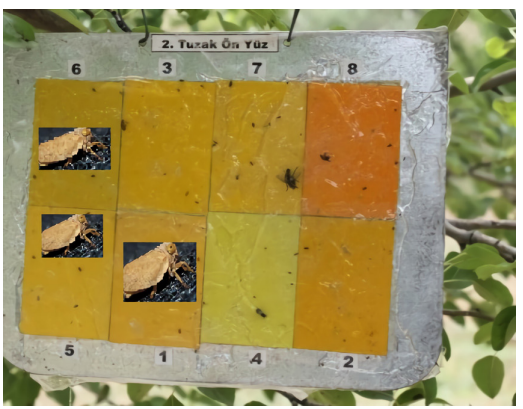

Fig. 1. Yellow stick traps with different ral codes on trees.

Table 1. Trap codes (Özgen et al, 2013; 2020).

Number	Code	Trap Name		Number	Code	Trap Name
One	1021	*Kadmiumgelb*		**Five**	0279	*Scaniagelb*
Two	1003	*Signalgelb*		**Six**	1012	*Zitronengelb*
Three	1018	*Zinkgelb*		**Seven**	1023	*Werkehesgelb*
Four	1016	*Schwefelgelb*		**Eight**	1028	*Melonengelb*

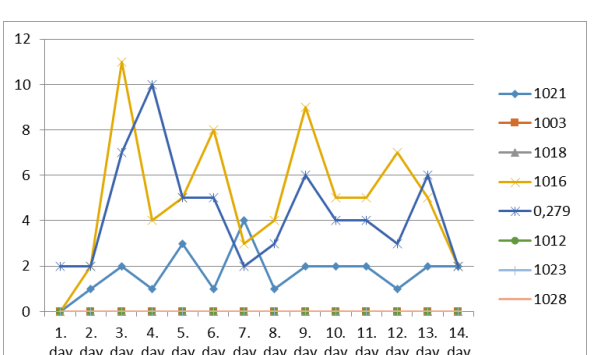

Fig. 2. Number of *Agalmatium bilobum* individuals caught with different tones of yellow traps.

CONCLUSIONS

Previous studies have focused on the effect of these coded tones to attract some pests. Thus, the psyllids (Hemiptera), *Agonoscena pistaciae* Burckhardt et Lauterer, 1989 (Aphalaridae) was catched with the 1016 codes trap while *Cacopyslla pyri* (L., 1761) (Psyllidae) was catched with for the 1023 coded trap (Özgen, Ayaz, Mutlu, & Bolu, 2013; Özgen et al, 2020; Kavak, Özgen, & Güral, 2020). Moreover, *A. pistaciae* studies were moved to the next stage and the most effective code was determined by making changes to the effective code (Altun, Yetkin, Işık, & Özgen, 2018; Özgen et al, 2020).

In addition, the fact that the ratio of males and females of *Agalmatium bilobum* caught on the sticky plates was higher than the ratio of females to males indicates that it will be important in terms of comprehensive mass control efforts against the pest. As a result, these traps are important in terms of biotechnical control of these pests in olive and almond fields. The creation of mass capture optimization and efficiency testing will allow for obtaining better results in the future.

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