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As vibrações no substrato produzidas pela locomoção e comportamentos de pré cópula dos machos é considerado um importante fator para a reprodução das espécies de escorpião. Neste estudo, investigamos a influência de rastros químicos e movimento das fêmeas no comportamento de reconhecimento sexual em machos do escorpião *Tityus pusillus*. Para obtenção dos rastros químicos, fêmeas foram mantidas em arenas redonda de vidro (13 cm de diâmetro) com papel de filtro como substrato por 24 horas para deixar vestígios químicos de sua presença. Para controlar o efeito das vibrações produzidas pelas fêmeas, as mesmas foram mortas por congelamento e oferecidas para machos nas arenas, quando sua temperatura se equiparou a do ambiente. O efeito da presença de vestígios químicos com fêmeas imóveis foi testado com os machos, no qual cada arena constou de uma repetição (n=26) enquanto o controle constou de fêmeas imóveis oferecidas em substrato não impregnado (n=26). O macho foi adicionado na arena tendo seus movimentos restritos para a aclimação por 5 minutos, posteriormente o macho ficou livre para movimentação. Todos os comportamentos realizados pelo macho foram registrados por uma filmadora. Os ensaios ocorreram durante o período noturno (19- 22 horas). Os vídeos foram analisados e os comportamentos pré-toque e pós-toque foram ranqueados de 1 a 5, considerando-se 1 como sem reação e 5 como balançar o metassoma ou tremer o corpo (Juddering). Os machos apresentaram mudanças em seus comportamentos pré-toque quando os vestígios químicos estavam presentes ($Z = 3.4589$, $p = 0.0003$), além de demonstrarem maior interesse reprodutivo após seu primeiro toque na fêmea imóvel ($Z = 1.7386$, $p = 0.0411$). Três indivíduos no grupo controle e dois no experimental terminaram a cópula com a deposição do espermatóforo. Nosso estudo evidencia que há resposta comportamental dos machos de *T. pusillus* quando entram em contato direto com uma fêmea coespecífica imóvel, sugerindo que não é necessário que haja movimentação ou vibrações no substrato por parte da fêmea para sinalizar ao parceiro, o que muda a percepção de que esses organismos seriam essencialmente responsivos a estímulos mecânicos. Esta resposta por sua vez foi intensificada por meio dos vestígios químicos da fêmea deixados no substrato.

Palavras chave: Floresta Atlântica, Cópula, Buthidae.

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Preliminary results of the use of artificial shelters as a tool to monitor the life-cycle of spiders in the field: a case study in the olive grove agroecosystem

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Spiders are important natural enemies in different agroecosystems. Studying and monitoring spiders in crops commonly involve sampling techniques devoted to killing a high amount of individuals for further study in the laboratory. On the other hand, live specimens

are usually hard to rear in the laboratory, and the effect of field conditions difficult to reproduce. The use of artificial shelters for monitoring *in vivo* the life-cycle of spiders has been largely neglected although some attempts and designs yielded promising results. The olive grove agroecosystem encompasses a series of economic and cultural activities of relevance in Portugal. Spiders are potential natural enemies in the olive grove agroecosystem. For example, active hunters at the soil level may reduce the abundance of pupae of the olive fruit fly *Bactrocera oleae* (Rossi, 1790; Diptera: Tephritidae). The objective of this work was to test the acceptance and efficacy of two models of artificial shelters by spiders in the field. Two models of shelters were built each one with two independent chambers at opposite sides. One model was entirely built of pinewood with circular entries and designed to be opened in the middle to be inspected. The second model was made of pinewood with semicircular entries and sealed with a transparent acrylic plate to allow visual inspection of the chambers. The fieldwork was carried out in an olive grove located at Cedães, Mirandela (Portugal) from March 2020 to June 2020. Five olive trees were selected along the central row of plantation. One shelter of each model was placed 50 cm away from the trunk of the olive trees. Each shelter was visited after 24h, five days, one, two, and three months. The number of occupied shelters, the genera of the spiders, and the number of cocoons were registered. A total of 18 chambers were found to be occupied during the study, one shelter after 24h, five after five days, two after one month, five after two months, and five after three months after allocation, respectively. Two families occupied the shelters, Agelenidae and Lycosidae, represented by *Eratigena* and *Arctosa*, respectively. Also, cocoons of the two genera were found in the chambers. Despite the low number of shelters, these preliminary results suggest that specimens of Agelenidae and Lycosidae could complete their life-cycle in the designed shelters in the field. The models of shelters used in this work could be useful tools to monitor life specimens in the field. Further designs of chambers, materials, and sizes should be developed and tested to cover a higher spectrum of the diversity of spiders suitable to be studied through this technique.

Keywords: Agelenidae, Lycosidae, monitoring, conservation, soil.

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Arañas y su diversidad en el Parque Jardín Botánico de Neiva

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PRELIMINARY RESULTS OF THE USE OF ARTIFICIAL SHELTERS AS A TOOL TO MONITOR THE LIFE-CYCLE OF SPIDERS IN THE FIELD: A CASE STUDY IN THE OLIVE GROVE AGROECOSYSTEM

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INTRODUCTION

Spiders are important natural enemies in different agroecosystems. Live specimens are usually hard to rear in the laboratory, and the effect of field conditions difficult to reproduce. The use of artificial shelters for monitoring in vivo the life-cycle of spiders has been largely neglected. Spiders are potential natural enemies in the olive grove agroecosystem. Active hunters at the soil level may reduce the abundance of pupae of the olive fruit fly *Bactrocera oleae* (Rossi, 1790; Diptera: Tephritidae). The **OBJECTIVE** of this work was to test the acceptance and efficacy of two models of artificial shelters by spiders in the field.

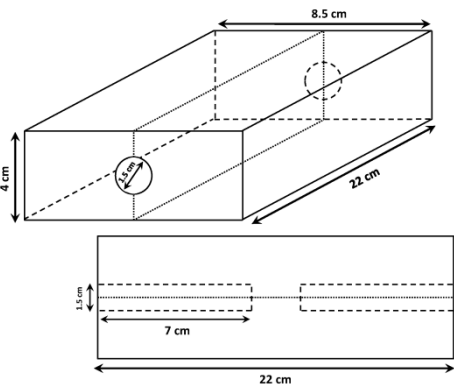


Figure 1. Design and measures of shelter M1. Thin dotted lines represent the aperture of the shelter to be inspected. Thick dotted lines in the lower design represent the position of the chambers.

MATERIAL AND METHODS

One model of shelter (M1) was built of pinewood with circular entries and designed to be opened in the middle to be inspected (Fig. 1). The second model (M2) was made of pinewood with semicircular entries and sealed with a transparent acrylic plate to allow visual inspection of the chambers (Fig. 2). Two metallic bars were coupled to help fixing to the soil. Shelters were placed in an olive grove located at Cedães (Portugal) (March 2020 - June 2020) in five olive trees following the central row of plantation. One shelter of each model was placed 50 cm away from the trunk of the olive trees. Each shelter was visited after 24h, five days, one, two, and three months.

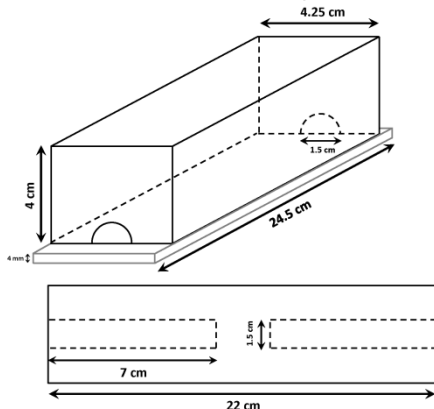


Figure 2. Design and measures of shelter M2. Grey lines in the upper design represent the acrylic plate to allow visual inspection of the chambers. Thick dotted lines in the lower design represent the chambers.

RESULTS

A total of 18 chambers were found to be occupied during the study, one shelter after 24h, five after five days, two after one month, five after two months, and five after three months after allocation, respectively. Two families of spiders occupied the shelters, Agelenidae and Lycosidae. Cocoons of the two genera were found in the chambers (Figs. 3 & 4).

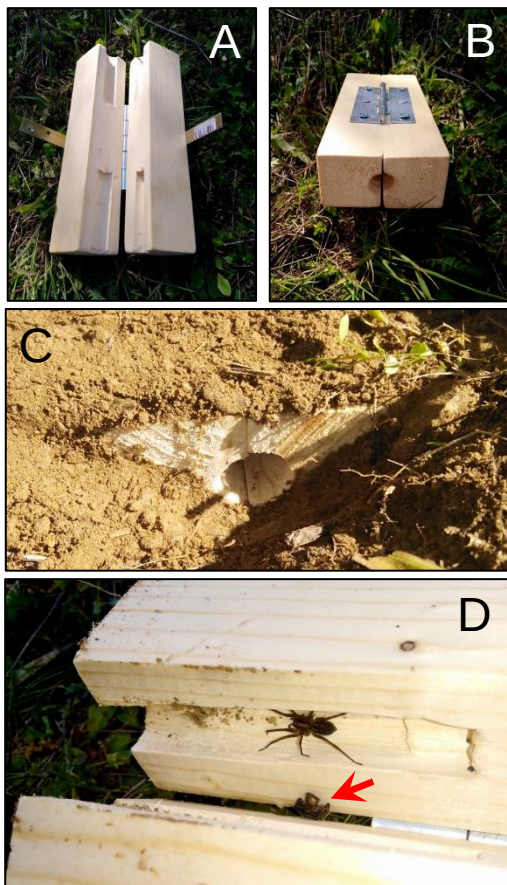


Figure 3. A: Artificial shelter M1 open. B: Artificial shelter M1 once closed. C: Aspect of artificial shelter M1 once installed. D: Artificial shelter M1 occupied by a Lycosidae. The red arrow indicates a molt.

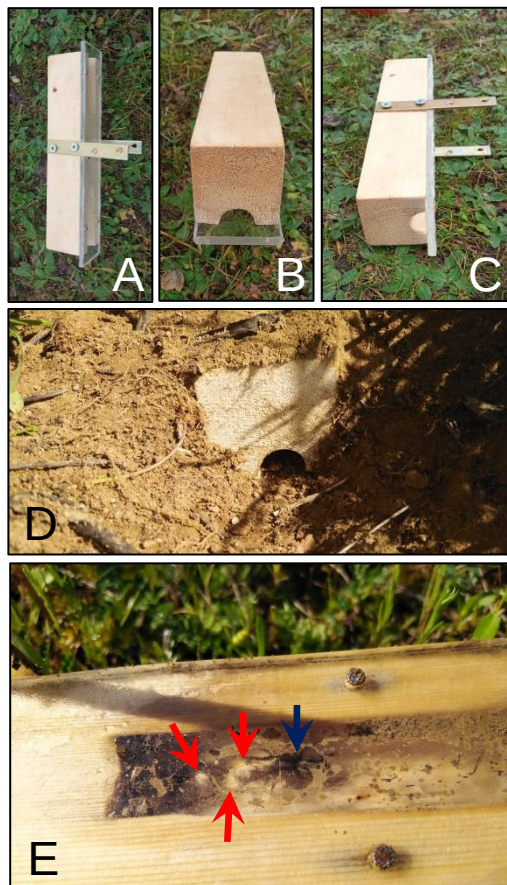


Figure 4. A-C: Artificial shelter M2. D: Aspect of artificial shelter M2 once installed. E: Chamber occupied by a female Agelenidae and its cocoon. Red arrow indicates cocoon. Blue arrow indicates the spider.

CONCLUSIONS

The shelters were cheap and easy to build. Despite the low number of shelters used, these preliminary results suggest that specimens of Agelenidae and Lycosidae could complete their life-cycle in the designed shelters in the field. The models of shelters used in this work could be useful tools to monitor life specimens in the field. Further designs of chambers, materials, and sizes should be developed and tested to cover a higher spectrum of the diversity of spiders suitable to be studied through this technique.

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