جامعة عبد المالك السعدي
ⵜⴰⵙⴷⴰⵡⵉⵜ ⵏ ⵄⴰⴱⴷⵍⵎⴰⵍⵉⴽ ⵙⵙⴰⵄⴷⵉ
Université Abdelmalek Essaadi

Pole for Doctoral Studies
Center for Doctoral Studies
Sciences, Technologies, and Medical Sciences

ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

Ms. MOULLAMRI Mouna

Will present here research work with the aim of earning a Doctorate

Doctoral program: Science and Engineering Technology
Discipline: Biology
Specialty: Biotechnology and biopesticides

On 19/07/2025 at 10H00 at the Conference Hall of the National School of Applied Sciences of Tangier, UAE
Under the Theme

Identification of Essential Oils with Insecticidal Activity against the Insect Pest Plodia interpunctella

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. AKSISSOU Mustapha	FS of Tetouan, UAE	President
Pr. EL GALIOU Ouiam	FST of Tangier, UAE	Reviewer
Pr. TAHERI Ahmed	FS of El Jadida, UCD	Reviewer
Pr. SAKAR El Hassan	FS of Tetouan, UAE	Reviewer
Pr. RAMADAN Ibtissam	FS of Tetouan, UAE	Examiner
Pr. ZERROUK HASSANI Mounir	FST of Tangier, UAE	Examiner
Pr. BOUAYAD Noureddin	FST of Tangier, UAE	Co-Supervisor
Pr. BAKKALI Mohammed	FS of Tetouan, UAE	Supervisor

Research Laboratory: Research team in Biotechnology and Biomolecules Engineering, FSTT

Abstract

Controlling the biotic stress caused by insect pests such as Plodia interpunctella is becoming difficult particularly with limited application of some conventional insecticides due to their environmental health risks. In addition, the development of resistance by P. interpunctella further complicates the situation and calls for less impactful and more natural approaches.

This study contributes to developing eco-friendly strategies for controlling this destructive insect. This work explores, for the first time, the insecticidal activity through the contact and fumigant modes of five essential oils; the leaves from Lavandula angustifolia, Salvia officinalis, and Laurus nobilis, the aerial parts from Mentha pulegium, and the flowers from Tanacetum annuum, against the three larval instars of Plodia interpunctella.

Chromatographic and mass spectral analyses pointed out that M. pulegium oil was dominated by pulegone (83.06%), while S. officinalis EO contained α-thujone (26.99%) and camphor (25.50%). Eucalyptol was a major component of both L. angustifolia and L. nobilis, their amounts accounting for 66.12 % and 39.46%, respectively. Regarding T. annuum EO was dominated by camphor (13.14%), Chamazulene, and Sabinene at percentages of 9.85, and 9.56 respectively.

The EOs were more effective in contact bioassays than in fumigation. M. pulegium EO caused the highest contact mortality, reaching 100% at 0.16 and 0.50 µL/cm². In fumigation assays, M. pulegium, L. nobilis and T. annuum EOs reached up to 56% mortality at the concentration of 0.31 µL/cm³ after 48 hours.

Behavioral assays revealed moderate repellency for M. pulegium EO (40–60% repellency), peaking at 56% within 120 minutes. S. officinalis EO showed variable repellency, with a maximum of 40% at 60 minutes, while L. angustifolia EO attracted larvae. L. nobilis and T. annuum EOs showed moderate repellency, reaching up to 60% for T. annuum within 5 minutes.

The application of the five oils at 8, 16, and 32 µL/pellet showed significant qualitative effects on all nutritional indices. Application of S. officinalis EO at 32 µL/pellet led to the lowest RGR (0.8 mg/mg/day) and ECI (0.039%) while RCR fell to 3.49 mg/mg/day when 16 µL/pellet was applied. The feeding Deterrent index (FDI) remained high at a percentage of 89.

Moreover, the EOs were also responsible for the induction of oxidative stress in the contact-treated larvae. M. pulegium EO induced production of the highest amount of malondialdehyde MDA (1784.58 nmol/mg protein) and Hydrogen peroxide H2O2 (10.46 µmol/mg protein). Antioxidant enzymes were also significantly decreased with the five oils, with the lowest SOD activity recorded with T. annuum EO (0.60 U/mg protein) and the lowest GST activity reported in S. officinalis EO treated group (65.23 µmol/min/mg protein).

To sum up, this investigation suggests the five EOs are effective contact toxicants as well as for inhibiting the feeding response of Plodia interpunctella larvae while simultaneously disrupting the insect's antioxidant system.

Keywords: Mentha pulegium, Salvia officinalis, Lavandula angustifolia, Tanacetum annuum, Laurus nobilis, Essential oils, Plodia interpunctella, larvae, insecticide, repellent, antifeedant, antioxidant system.