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PHEROMONE TRAP AGAINST THE MELON FLY (MIOPARDALIS PARDALINA BIG.)

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Abstract: The intensive development of agricultural production currently requires an expansion of the use of chemicals to protect plants from insect pests, which in turn leads to environmental pollution and irreparable losses in the biocenosis.The use of sex pheromones in integrated plant protection systems leads to the need to develop a convenient pheromone trap.This article describes a method of controlling the melon fly using the pheromone component 4 (4-methoxyphenyl)-2-butanone, 1,4-benzyldicarboxylate. A pheromone trap is a design with bait, a rubber capsule dispenser, treated with a mixture of pheromone substances. The results of using pheromone traps to monitor the melon fly in open ground are presented.

Key words: Adult, melon fly, egg pupa, caterpillar, rubber dispenser, 4(4-methoxyphenyl)-2-butanone, 1,4-benzyldicarboxylate, pheromone trap.

The melon fly (Miopardalis pardalina Big.) is widely distributed across Asia and several European countries, particularly in Azerbaijan, Armenia, Georgia, Cyprus, Turkey, Ukraine, Afghanistan, Israel, India, Jordan, Iraq, Iran, Kazakhstan, Kyrgyzstan, Lebanon, Pakistan, Saudi Arabia, Syria, Tajikistan, Turkmenistan, and Uzbekistan. It primarily infests both wild and cultivated plants of the Cucurbitaceae family. The melon fly can damage Solanaceae plants at any stage of growth—from early sprouting to full crop maturity.

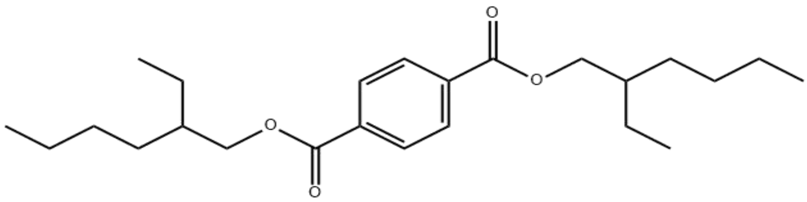
Throughout the year, the insect produces 3–4 generations. The flies emerge during the flowering period of melons. Female flies lay their eggs in the skin of young fruit and ovaries, as well as on plant leaves. The larvae penetrate the fruit flesh, where they feed on seeds and juice, then leave the fruit and pupate in the soil.

The spring flight coincides with the fruit formation period of host plants. At this time, the soil temperature—where the insects overwinter—reaches +20°C. The pest's flight is observed from early June to mid-October. The insects feed on fruit juice. The lifespan of the imago is approximately 2 months. The puncture sites in the fruit flesh can serve as an environment for the development of viral and fungal diseases. The first signs of melon fly infestation are the appearance of small bumpy spots or just bumps at the puncture sites on the fruit. Later, as the larvae develop, internal rotting of the fruit begins. Damaged fruits become unsuitable for further use [2,4].

As a result of the conducted research, attractant substances of the melon fly Myiopardalis pardalina Big. were isolated and identified. Their biological activity was determined depending on the composition and quantity of the present substances. In addition, preparative doses and compositions of attractant substances with the highest insect response were studied. The most effective pheromone trap design was identified, and recommendations for pheromone-based monitoring were developed for practical application within integrated pest management systems [4,5].

The study of the structural features of the compounds isolated from the melon fly Myiopardalis pardalina Big. was carried out at the Institute of Bioorganic Chemistry, Academy of Sciences of the Republic of Uzbekistan (IBOC AS RUz). For this purpose, methylene extracts from the sternal glands of the melon fly were analyzed using electroantennography (EAG) and gas chromatography-mass spectrometry (GC-MS). As a result of the study, EAG responses of males to one-minute fractions of female Myiopardalis pardalina Big. were obtained, along with GC-MS chromatograms recorded using an Agilent 8890 GC gas chromatograph.

Based on the results, the structure of one of the food attractants of the melon fly Myiopardalis pardalina was identified, with a signal at RT = 23.247, which corresponded to the structure of bis(2-ethylhexyl) ester of 1,4-benzenedicarboxylic acid [3,6].



The behavior of the melon fly was also analyzed under field conditions using various types of pheromone traps on cucurbit crops in the Karakalpakstan region. The experiments utilized adhesive devices of the "Delta" type—triangular constructions made of laminated cardboard with a replaceable sticky insert inside. A rubber capsule containing the attractant (pheromone dispenser) was placed at the center of the sticky surface. Three traps were suspended above the plants at a height of 20 cm. The sticky inserts were replaced with new ones as they became contaminated.

The devices were placed starting from the appearance of the pest in melon fields during the winter–spring and summer–autumn periods, which lasted from April 20 to June 10 and from June 11 to October 11, respectively, over an area of 160 m². For bioassay testing, a mixture of attractant compounds with the most significant response was used. Pheromone traps were placed at a rate of one device per 5 m², with a pheromone mixture dose of 0.5 mg per dispenser. The experiments evaluated the attractiveness of "Delta"-type pheromone trap constructions, taking into account the melon fly population density.

The trials demonstrated that a total of 54 male melon flies were captured in 10 pheromone traps, with the “Delta”-type device capturing on average only 7–8 individuals. Thus, the use of pheromone monitoring significantly improved both the yield volume and the quality of the fruits.

Conclusions:

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The theoretical basis for the use of insect pheromones in plant protection lies in the historically developed chemical interactions between plants and animals through the aerial environment. Most nocturnal Lepidoptera, particularly the melon fly and the tomato moth, have developed a highly sophisticated pheromone system, the chemical composition of which is quite different from the component makeup of host plants.

Thus, the conducted study characterized the possibility of mass trapping of the melon fly (Miopardalis pardalina Big.) in cucurbit crops over two seasonal periods. A comparative evaluation of traps and dispensers with high insect-attracting efficiency was also presented. The most promising was the mixture of 4-(4-methoxyphenyl)-2-butanone and 1,4-benzenedicarboxylate in the pheromone trap design. All tested options are recommended for detection and mass trapping of the melon fly under open-field conditions.

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