

Assessing Rodent-induced Greenhouse Crop Yield Losses and Management Options in Crete, Greece

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Abstract

The presence and activity of rodents in urban and rural areas causes serious negative impacts on public health and the agricultural economy, while uncontrolled spread can also disrupt the ecological balance in local ecosystems. It is indicative that from 1930 to 2018, the estimated cost of rodent activities across all sectors amounted to \$3.28 billion, with constantly increasing trends (Diagne et al., 2021), while the World Food Organization and the World Health Organization estimate food losses due to rodents at 5% of the annual quantities produced, a fact that is particularly burdensome for underdeveloped countries (Jurišić et al., 2022). Synthetic (chemical) rodenticides constitute the most common method for dealing with rodents. In recent years, this method has been considered ineffective due to the development of resistance in targeted species, the direct and indirect impacts on non-targeted species, and the induced environmental pollution. Furthermore, climate change is projected to exacerbate the problem, as rodents have a greater ability to adapt in vegetation changes compared to other mammals (Kholoud et al., 2020) and rodent predator populations are projected to decline (Cameron and Scheel, 2001; Mougeot et al., 2019). To address these challenges and to mitigate rodent-induced food losses and the detrimental environmental impact of synthetic (chemical) rodenticides, Ecologically Based Rodent Management (EBRM) has been proposed as a comprehensive approach that integrates biological, ecological, physical, and cultural methods. However, the widespread adoption of EBRM is still limited. The Mediterranean region is particularly vulnerable to both rodent activity and climate change, and therefore the adoption of EBRM can have multiple benefits. In Crete, the second largest Mediterranean Island, rodents are among the pests that threaten the local lucrative greenhouses production, nevertheless, evidence on the methods used against them, their effectiveness, and therefore the environmental pressure remains unclear. To address this knowledge gap, we conducted a two-stage survey between 2021 and 2023, involving 785 greenhouse managers from 2,179 greenhouses (16.95% of the

total number of greenhouses in Crete). The aim was to collect information, specifically focusing on greenhouse managers perception on EBRM. Preliminary results indicate that the majority of greenhouse managers (49.9%) rely on chemical measures, followed by those who use a combination of chemical and non-chemical methods (40.6%), while a small percentage (9.6%) use only non-chemical measures. Among the surveyed greenhouses, 40.9% reported a rodent infestation problem in the past 3 years. From these cases, 28% used exclusively chemical control to eradicate the problem, only 1.4% relied solely on non-chemical means, and 71.1% used a combination of chemical and non-chemical control such as traps and predators. A second-stage survey reached a sample of 79 greenhouse managers who had participated in the first stage and experienced rodent issues in the past. The result revealed high satisfaction (91.1%) with the common commercial rodent control products. However, there was also significant interest (78.4%) in non-chemical methods such as EBRM. Findings highlight the need to increase awareness and adoption of EBRM among local greenhouse managers.

Keywords: rodent, greenhouse, methods, crop, yield, losses, management, Crete, EBRM

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