

Investigating the Impact of Abamectin on Dust Mite, *Oligonychus afrasiaticus* Density and Anatomical Features of Date Fruits cv. Halawi

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Abstract

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The high nutritional value and economic importance of date fruits are compromised by severe damage caused by pests such as the dust mite *Oligonychus afrasiaticus*. To control this pest, chemicals such as Abamectin are commonly used, although this may cause changes in the anatomical characteristics of date fruits. This study aimed to investigate the effect of Abamectin on the density of dust mites and the anatomical features of cv. Halawi dates. Date fruits were sprayed with Abamectin (1.8% EC) in five concentrations (0.0, 0.25, 0.50, 0.75 and 1.0 ml/L) during the Hababuk stage, and dust mite density and several anatomical characteristics of the fruits were evaluated. The results obtained showed a decrease in dust mite population density with increasing Abamectin concentration and a significant impact on certain anatomical features of date fruits. The highest thickness of the exocarp, cuticle, epidermis, hypodermis, stoncells, outer mesocarp, and inner mesocarp, as well as the number of pith cells were observed at the concentration of 1.0 ml/L. However, a reduction in the tannin layer was detected at higher concentrations. Positive correlations were found between Abamectin concentration and the thickness of certain fruit components, as well as the number of pith cells, whereas a negative correlation was found with dust mite population density. The study concluded that Abamectin application directly reduces dust mite density and improves the anatomical characteristics of date fruits.

Keywords: Abamectin, date palm, dust mite, pest density, anatomical characteristics.

Introduction

The date palm tree, *Phoenix dactylifera* L. is one of the oldest and most important cultivated species, being an economically significant fruit tree that is cultivated in tropical and subtropical regions of South West Asia and North Africa. In addition, it can be grown in Australia, Mexico, South America, South Africa, and the United States (Al-Alawi *et al.*, 2017). The date palm belongs to the family of Arecaeae and encompasses more than 200 genera and around 5000 species (Jonoobi *et al.*, 2019). The importance of the date palm lies in its fruits having high nutritional and economic value due to being rich in carbohydrates, fibers, proteins, minerals and vitamins (Al-Alawi *et al.*, 2017). Therefore, date palm fruits and their products have contributed to one of the elements of global food security for more than 5000 years (FAOSTAT, 2018). It was also mentioned by Al-Alawi *et al.* (2017) that color, taste, moisture and the absence of damage, such as cracks, defects and surface blemishes that are caused by pests, are among the important quality characteristics of date palm fruits to provide high nutritional and economic value. Therefore, control operations are directed to reduce the incidence of these pests (El Bouhssini & Faleiro, 2018; Haldhar *et al.*, 2015).

Oligonychus afrasiaticus is considered one of the economically important pests of date fruits, and can cause a reduction in the quality and quantity of these fruits (Ben Chaaban *et al.*, 2011; Elhalawany *et al.*, 2020). This pest causes economic damage to date palm production in Iraq,

reaching up to 90% of total production in arid, sandy, and windy climates (Al-Jboory & Al-Suaide, 2010; El-Shafie, 2022). The damage occurs directly by feeding on date fruits and indirectly by spider webbing produced by the mite, which leads to the deformity of fruits, changes in their nutritional, morphological, and anatomical characteristics (Ben Chaaban *et al.*, 2011; Elhalawany *et al.*, 2020; El-Shafie, 2022). In addition, the spider webbing blocks light and air exchange, which affects metabolic processes in fruits (Elhalawany *et al.*, 2020), resulting in a decrease in yield and quality. Therefore, various methods have been used to reduce the damage caused by this pest (Arbabi *et al.*, 2017).

Despite the availability of multiple methods to combat this pest, chemical control of date palm mites is one of the most widely used methods to reduce its impact (Alhewairini *et al.*, 2021; El-Shafie, 2022), because it is rapid, economically feasible and easily applicable in comparison to other available methods (Al-Dosary, 2010; Ali & Fhaid, 2019). One of the main insecticides used in controlling this pest is Abamectin which belongs to the Avermectin family. Abamectin is a new and effective insecticide against a wide range of phytophagous pests. Its mode of action relies on its ability to disrupt the nerve system, thereby allowing Abamectin to kill resistant insects to other insecticides. It does not accumulate in the environment and has low toxicity to non-targeted animals; thus, it is widely used for mites, insects and nematode control (Al-Dosary, 2010; Alhewairini & Al-Azzazy, 2019). Numerous studies have reported the high efficacy of Abamectin in controlling date palm mites in different parts of the world (Al-Dosary, 2010; Palevsky *et*