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Variability of the physicochemical composition between unscathed and dates infested by the moth *Ectomyelois ceratoniae* Zeller

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Abstract – In the Saoura region, the date moth is a pest of major economic importance where it causes considerable damage, either on the cluster, by the premature fall of dates or during storage where it degrades the commercial quality of the fruits.

The damages can sometimes affect 80% of the global crop.The level of infestation in the cultivar Fégous is higher compared to the cultivar Hmira. This variation could be due to the physicochemical composition as well as the morphological characteristics of the variety. Fégous is considered among early-maturing varieties with a thin epicarp that makes the fruits fragile and vulnerable to attacks by the moth. The calculation of the pulp / nucleus ratio clarifies the reasons for the increase in the rate of infestation in Fegous, 51%

We note that the rate of infestation is considerable in the dates without perianth 64.86% however 73.68% of the dates with perianth remain unscathed

the total sugars of the two infested varieties either Fégous (64%) or Hmira (43%). This decrease is a consequence of the intensive degradation of sugars by date moth , it use them to cover its energy needs during its development and also to prepare itself for pupation however the protein content of infested dates was greater than that of unscathed.

Keywords: Saoura region, Fégous, Hmira ,date moth, , physico-chemical analyzes.

1. Introduction

Date palm is one of the main riches of Saoura region (Algeria), and that through its hot and dry climate, which allows the tree to grow and complete the ripening of its fruits. The exploitation of date palm is a major asset for the development of the Saharan areas especially at the present time where Algeria gives much more importance to natural resources. As result, preservation, development and the rational exploitation of oases have become an urgent necessity in Algeria. Therefore, to achieve these main objectives, the research in this field is a prerequisite. Indeed, a well maintained palm can produce up to 100 kg of dates per year. However its growth, flowering and fruiting is closely linked to ecological factors, including the biotic and abiotic one.

Date moth *Ectomyelois ceratoniae* Zeller, is one of the pest how reduce the producton of dates enormously, it is an extremely polyphagous pest. Its larva lives at the expense of several fruits and causes enormous damage. It is very polyphagous

and attacks a multitude of cultures and spontaneous plants in very different bioclimatic stages (DOUMANDJI,1981).

It is a cosmopolitan predator well represented throughout the world, especially around the Mediterranean, its polyvoltine power has allowed it to exceed five generations per year, Depending on food disponsibility and climatic conditions. This study aims to represent the degree of the sufferance of Phoeniculters in the Saoura taking into account the losses and the damages caused by the moth which degrades quantitatively and qualitatively the yield of the date palm.

2. Material and methods

The date varieties selected during this study are widespread in palm groves of the Saoura region. These are the most consumable, Fegous and Hmira. The choice of these varieties is justified by their gustatory quality, the abundance and their shelf life.

We have performed physicochemical analyzes for these two varieties. The dates intended for the analyzes are stored for eight months under unfavorable conditions of temperature (+ 30 ° C) and humidity (+ 10%).

After storage the dates underwent the following physico-chemical analyzes:

- Humidity level;
- Sugar content;
- Protein content;
- Fat content;
- Ash content;
- Hydrogen potentiel.

2.1 Infestation Rate

The perianth is the set of envelopes that protect the reproductive organs of the flower, it includes the calyx composed of sepals and provides a protective function.

The larva of the moth is lodged between the pulp and the nucleus, and gradually fills the space of the dates with silk thread and excrement (DOUMANDJI-MITICHE, 1977). In most cases, the chrysalis lives in date while the larva developed it is oriented in such a way that its cephalic part is in contact with an orifice formed by the larva in the wall of the fruit before its moulting, and by which the imago will emerge (LE BERRE, 1978). In the date palm the perianth persists on dates after pollination to ensure the protection of the fruits. It acts as a hat that protects dates against alterations, particularly the attacks of the moth during the breeding season where females always seek holes to lay eggs away from predators and enemies . The favorable place is represented by the vacuum which exists inside the dates through the perianth. We note that the rate of infestation is considerable in the dates without perianth 64.86% however 73.68% of the dates with perianth remain unscathed (**Figure 1**).

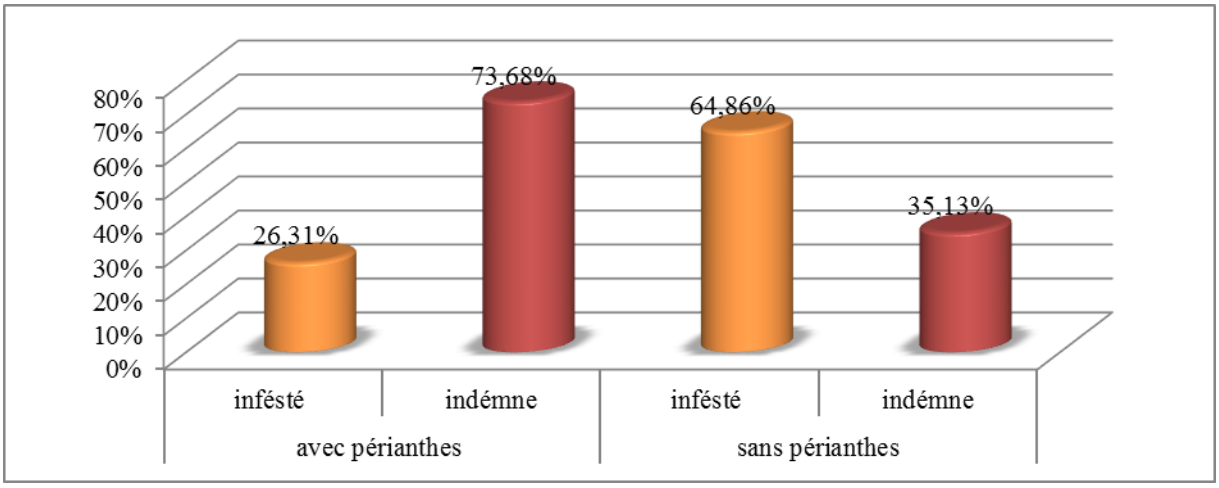

Figure 1. Rate of infestation of dates with and without perianth in both cultivars

2.2 Humidity level

Water is one of the essential constituents of the fruit. It has a fundamental importance on the quality of the dates, and acts on their preservation (BENSALAH & HELLALI, 2003). The water content of the unscathed Fégous (19.72%) is less than that found by MAKHLOUFI (2012) (21.90%). This difference usually belongs to the harvest period and storage temperature. For the unscathed Hmira the humidity level aproximate to (21.22%) , however the infested Fégous and Hmira are respectively (17.7%) and (17.86%). generally this difference is due to the presence of the insect (**Figure 2**).

The two varieties studied Fégous and Hmira are dates of good character because the humidity level Varies between 10 and 24%, Indicating the suitability of these fruits for a long-term storage under ambient conditions. On the other hand, if humidity level exceeds 30%, i.e the bad character and this reduces the storage period.

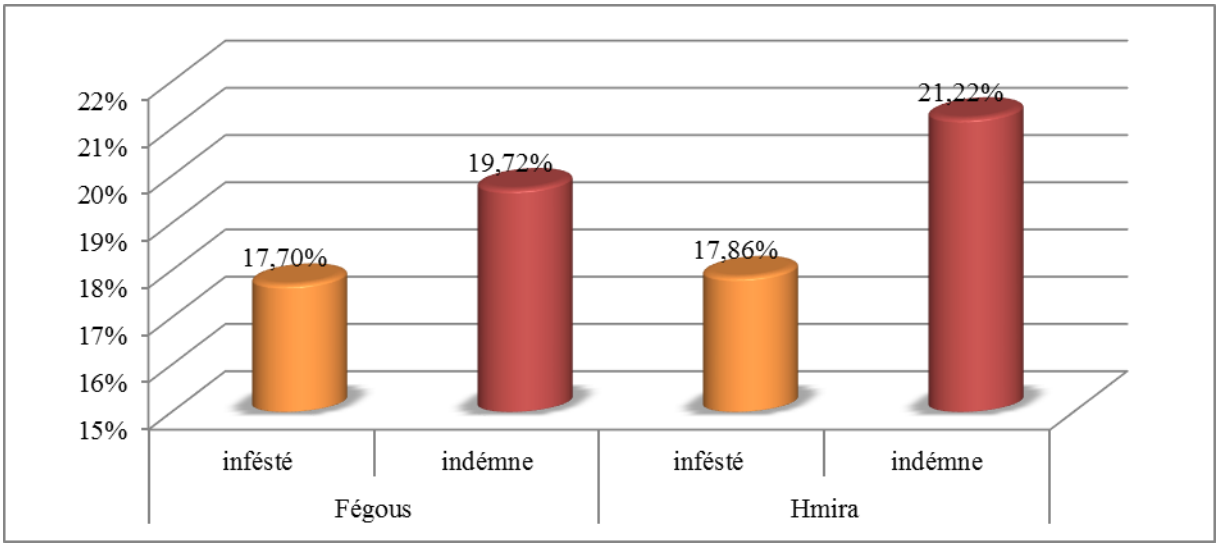

Figure 2. Humidity level of infested and unscathed dates for both cultivars.

2.3 Sugar content

Sugars are the most important constituents in the date. They are also responsible for the sweetness of the food, and consequently their percentage in dates is very high compared to other constituents. Sugars come in two forms:

Sucrose and reducing sugars (AMELLAL, 2008). In parallel, the total sugars of the two infested varieties either Fégous (64%) or Hmira (43%). This decrease is a consequence of the intensive degradation of sugars by date moth , it uses them to cover its energy needs during its development and also to prepare itself for pupation (**Figure 3**).

$$C_{12}H_{22}O_{11} + H_2O \longrightarrow C_6H_{12}O_6 + C_6H_{12}O_6$$

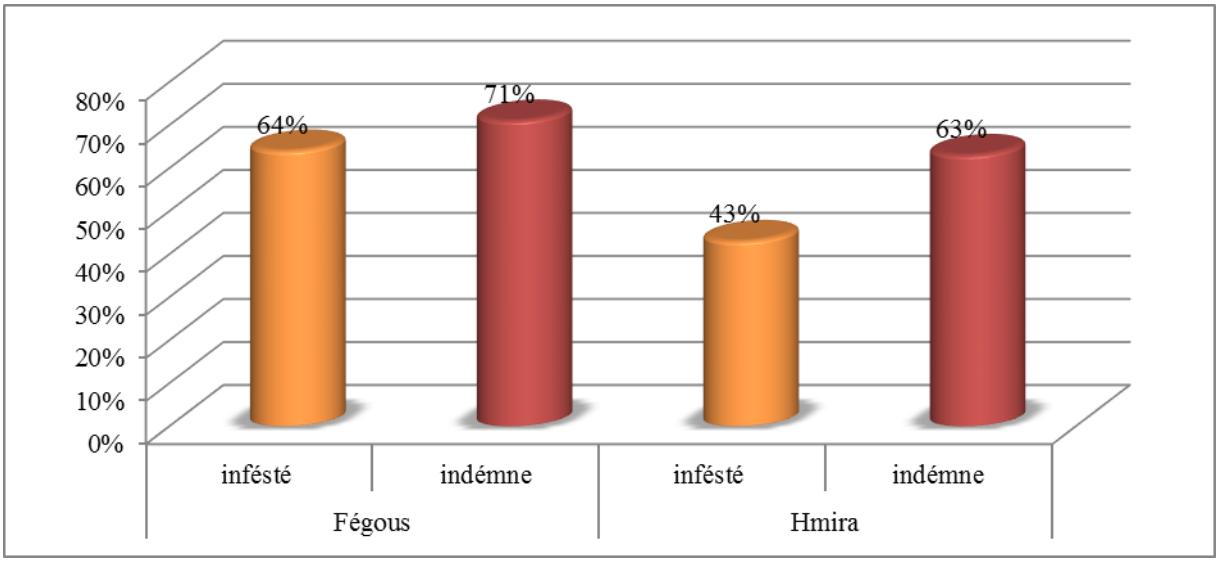

Figure 3. Total sugars of infested and unscathed dates for both cultivars

2.4 Protein content

The protein content of infested dates was greater than that of unscathed, this can be explained as follows:
The moth secretes proteic enzymes, which are non-consumable components during reactions;
Moths have very varied manners, But most live in tunnels or clumps of silk, or bind leaves together by silk threads.According to JEAN-JACQUES, (1996) silk consists essentially of two proteins: fibroin (63.5%) and sericin (22.5%). The fibroin forms the central part of the strand while the sericin surrounds the central part of the strand. The remaining 14% includes other constituents and traces of water (**Figure 4**).

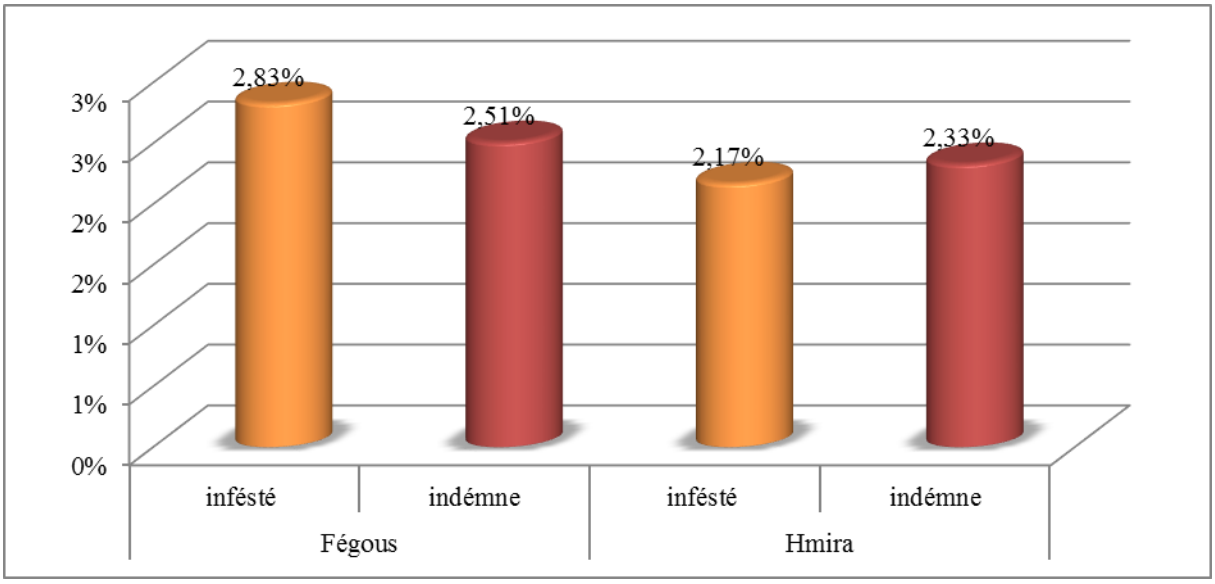

Figure 4. Protein content of infested and unscathed dates for both cultivars

2.5 Fat content

The fat content of the infested dates is lower than unscathed one (**Figure 5**), Fégous (1,15% becomes 0.78%) and Hmira (1.55% becomes 1.09%). For this reason the date moth uses lipids of the dates to avoid the deficiency of fatty acids, because the absence of these elements especially the linoleic and linolenic acids is translated, either by an extension of the larval life or an considerable mortality, or by wings deformation of adults and even an impossibility of emergence, AMADOU, (1984).

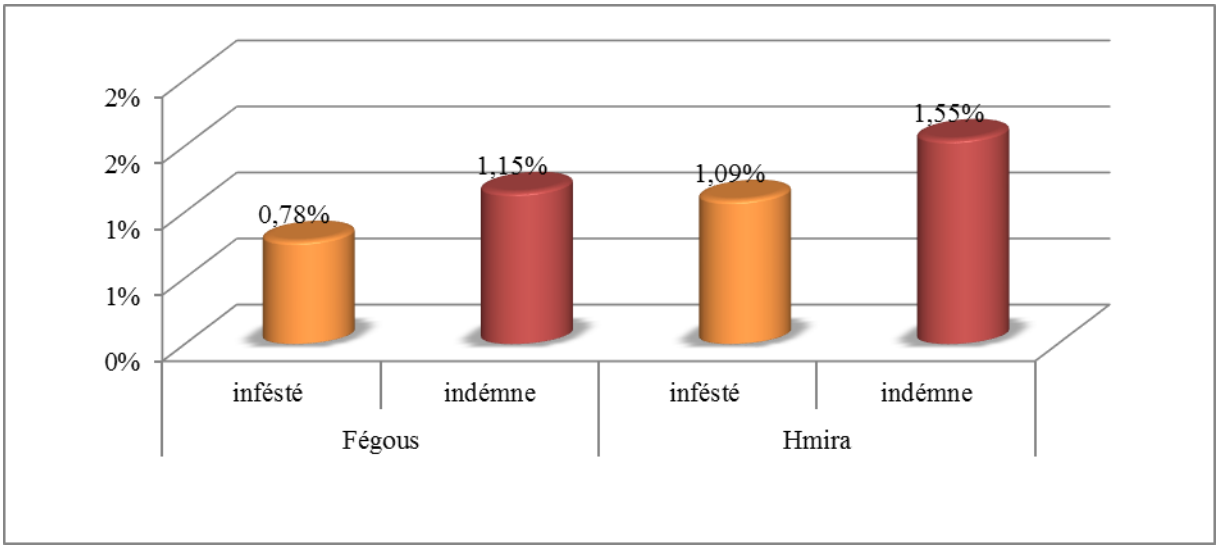

Figure 5. Fat content of infested and unscathed dates for both cultivars

2.6 Ash rate

Dates are an appreciable source of mineral elements. According to FAVIER et al., (1993), They contain 2% of ash. Saudi and Iraqi varieties contain higher quantities swing between 2 and 4% (SAWAYA et al., 1983). We note that the ash rate of the infested dates is lower than that of the unscathed, because the moth uses some mineral elements for the synthesis of its secondary metabolites (**Figure6**).

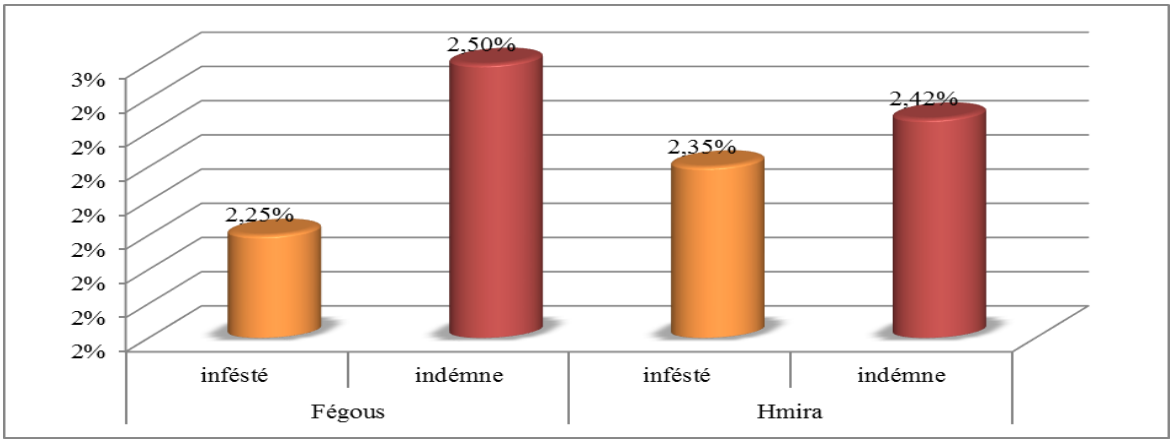

Figure 6. ash content of infested and unscathed dates for both cultivars Fegous and Hmira.

2.7 Hydrogen potential

pH is a quality index determining the food ability of conservation. It is one of the main obstacles that microbial flora must overcome to ensure its proliferation. A pH of the order of 3 to 6 is very favorable to the development of yeasts and molds (GIDDEY, 1982, GATEL, 1982, BRISSONET et al., 1994) .

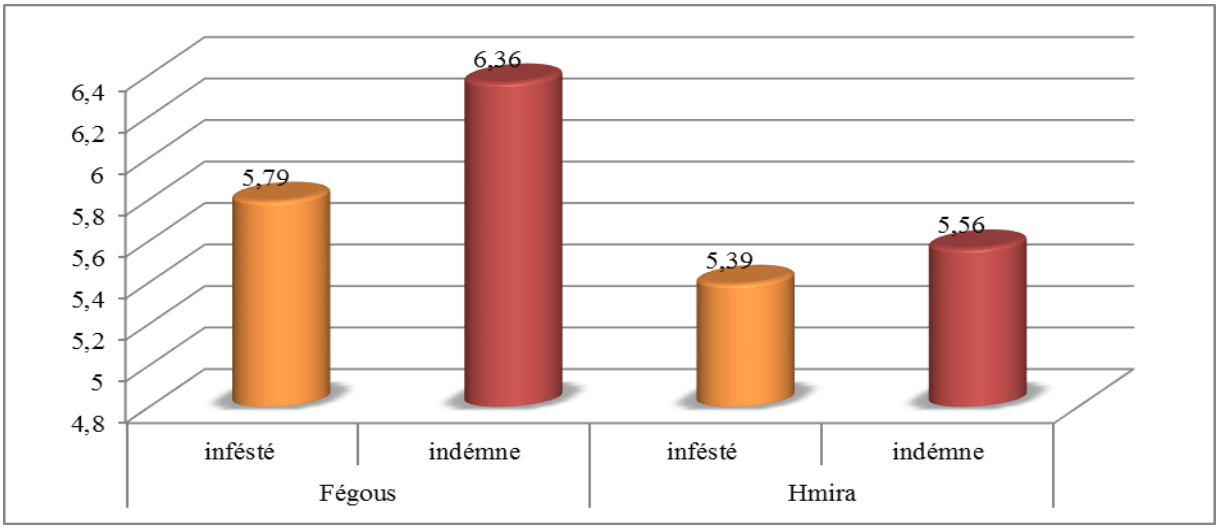

Figure 7. hydrogen potential of infested and unscathed dates for both cultivars

3. Conclusion

The stored dates are exposed to the infestation of date moth which consequently cause fungal contamination. The development of this fungal flora under suitable conditions (temperature, humidity, pH, etc.) can have adverse consequences by altering the organoleptic properties and decreasing the nutritive quality. Our study seeks to demonstrate the relationship between some physicochemical parameters and the frequency of infestation by the moth.

As a perspective it is desirable to study the consequences of the infestation of dates by the moths and the different bactiriennes and fungal strains available and their effects on human health.

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