



Research Article

EFFECT OF INFESTATION ON FRUIT CHARACTERISTICS OF SOME STORED DATE PALM [*Phoenix dactylifera* (L.)] CULTIVARS IN KATSINA, KATSINA STATE, NIGERIA.

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ABSTRACT

An investigation was carried out in Katsina, Katsina State on three dry date fruits cultivars; "Dan-Mali", "Digila" and "Targal" with the objective of finding the relationship between date fruits characteristics and stored insect pest infestation. Fifty each of date fruits at "tamr" (dark brown and hard) stage were sampled for analysis. The fruits were weighed; sliced open to measure flesh thickness and determine infestation on 1 and 0 scale for infestation and non-infestation, respectively. Proximate analysis of the fruits was carried out. The result showed that the mean average weight of 50 date fruits of "Dan-Mali" cultivar (19.00g) is higher than the other two cultivars (8.50g and 7.63g) "Digila" and "Targal", respectively. The average flesh thickness of "Dan-Mali" was found to be significantly ($P < 0.05$) higher than the other cultivars. Similarly, the proximate analysis on the nutrient composition showed that "Digila" cultivar has the highest mean percentages of carbohydrates (81.65) and protein (6.20) followed by "Dan-Mali" (77.49 and 5.63) and "Targal" (75.74 and 5.05), respectively. The correlation result between infestation and flesh thickness was however weakly and negatively related.

Key words: Date palm, characteristics, cultivars and infestation

1. INTRODUCTION

Date palm, *Phoenix dactylifera* (L.) is one of the oldest tree cultivated in the world (Kader and Hussain, 2009; Al-Saoud and Al-Ajlan, 2013). It is a plant that is widely grown in the Arab world where it originated from (Al-Ajlan, 2007) (Plate 1). It has been a staple food for the population of the Middle East and North Africa for reserved thousands of years (Ait-Oubahou and Yahia, 1999). On a commercial scale, the Middle East and North Africa are the major date palm producers in the world (Al-Ajlan *et al.*, 2007). Ait-Qubahou and Yassia (1999) described it as high energy food for both human and animal consumption. Saeed and Yousof (2004) described nutritional value of date to be high because it contains carbohydrates and minerals with sugars accounting for more than 70%. Djerbi (2000) regarded date fruits as a complete diet since it contained all the necessary ingredients required by human body.

In Nigeria, date is an important item of commercial trade in the northern states where it is sold in mosques, markets and motor parks (Muhammad *et al.*, 2014). Date palm is extensively grown for its edible fruits called date (Al-Ajlan *et al.*, 2007) (Plate 2). Aisagbonhi *et al.* (1988) stated that there are three main types of dates fruit based on their moisture content. They are soft, semi-dry and dry dates which are harvested at different maturity stages. Aisagbonhi *et al.* (1998), Kader and Hussain (2009) described the stages as, "Habbabouk"- cream white (earliest stage of development); "Kirmi"- Green hard; "Khala"- red or yellow, hard; "Rutab"- light brown and soft and "Tamr"- dark brown and hard.

Like all other crops, date fruits are attacked by insect pests. The fruits are attacked by lepidopterans and coleopterans that render the fruits unfit for human consumption (Muhammad *et al.*, 2014) (Plate 3). The insects bore and live within the fruits causing damage in form of tunneling/feeding on the soft internal

fruit wall (mesocarp), depositing frass, webbings, pupal case/exuvia etc. Dates are commonly attacked by more than twelve insect species that feed on stored dates causing fruit damage. Aisagbonhi *et al.* (1988), Aisagbonhi (1988) and Muhammad *et al.* (2014) reported the attack of dates by *Oryzaephilus mercator* Fauvel (Coleoptera: *Plodia interpunctella* Hubner (Lepidoptera: Pyralidae), *Coccytrypes dactyliperda* (Fabricius) Coleoptera: Scotylidae, *Araecerus fasciculatus* (Degree) Coleoptera: Anthribae and *Loxostege massalis* Walker (Lepidoptera: Crambidae).

Date fruits characteristics differ according to cultivars. Kader and Hussain (2009) described sweetness as one of the quality indices for targeting each cultivar to specific market. Ait-Oubahou and Yahia (1999) and Kader and Hussain (1999) identified sucrose as the main sugar in some cultivars (most of the semi dry and dry cultivars) while reducing sugars (fructose and glucose) are predominant in others (most of the soft cultivars). Dates also differ in their flesh thickness. Ait-Oubahou and Yahia (1999) identified dates with thick and thin flesh and described the proportion of seed to flesh as an important parameter for fruit quality and classification.

The importance of date fruit in the study area cannot be over estimated. The fruit is widely eaten as food; it is used in social functions during wedding and naming ceremonies. Furthermore, it is a commodity traded between international borders (Muhammad *et al.*, 2014). Date fruits are commonly infested with life or dead larva (Plate 4). This consequently affects its acceptability by consumers. This study was undertaken in order to determine the effect(s) that infestation by stored insect pests has on some of the date fruit characteristics such as flesh thickness and sweetness.

2. MATERIALS AND METHODS

Fifty (50) dry date fruits each of "Digila", "Targal" and "Dan-Mali" cultivars were randomly collected from Katsina Central Mosque premises (near Emir's palace). The study was carried out in the Biology laboratory,

Federal University, Dutsin-ma. The fruits were cut open and observed for presence of insects. Sign of insect presence was scored on 1 and 0 scale. Presence of life or dead insect, life or dead larva, exuvia/pupal case, frass deposition, cocoon/webbing signifies incidence and was scored **1**. Absence of any of these parameters is scored **0**. Proximate analysis of date fruits was carried out at the Product Development Research Programme, Institute for Agricultural Research, Ahmadu Bello University, Samaru, Zaria.

2.1 Physical characteristics

Data measured was on thickness of endocarp of the fruit. Measurement was done with a vernier caliper (White-Gew model) and expressed in centimeters (cm).

2.2 Chemical characteristics

To enable an assessment of the chemical composition of the different date cultivars, observations were made on the following parameters: moisture content, ash, fat, protein, fibre and carbohydrates. All data collected were subjected to statistical analysis using correlation, t-test and descriptive statistics.

3. RESULTS AND DISCUSSIONS

Result in Table 1 showed the mean weight of date cultivars sampled in the study area. The result showed that the highest mean weight of date fruits were recorded on the "Dan-Mali" cultivar (19.00g). Recorded weights of the other date fruit cultivars were "Digila" (8.50g) and "Targal" (7.63g), respectively. This could be due to the thickness of the endocarp of the "Dan-Mali" cultivar. "Targal" was found to be the thinnest.

The result in Table 2 showed the average flesh thickness of the different date fruits sampled. The result showed that there were significant differences among the date fruit cultivars. "Dan-Mali" was found to be significantly thicker (0.60 ± 0.013), "Digila" with (0.45 ± 0.009) while Targal had the thinnest flesh (0.37 ± 0.006). This finding was however at variance with the

result reported by Saeed and Yousof (2014) on "Barakawi" date cultivar. They recorded fruits flesh thickness of $0.4 \pm 0.01\text{cm}$ for good fruits and $0.1 \pm 0.02\text{cm}$ for infested fruits respectively.

The result in Fig. 1 showed the nutrient composition of the sampled date fruit cultivars. The result indicates that "Digila" dates have the highest mean percentage of carbohydrate and protein. This indicates that it contained the most essential food nutrients required by human and animal body. The result corroborates the earlier work reported by Ait-Oubahou and Yahia (1999) that flesh of dates contains small amount of protein and fat in the range of 1.5 - 2.0% for protein; 2.5 - 7.4% fat while dry and semi dry ones are highly rich in sucrose. This made "Digila" taste better than the other cultivars. Similarly, it is in accordance with the result reported by Saeed and Yousof (2014), that carbohydrate content of "Barakawi" cultivar was in the range of 76.53 ± 0.23 and 74.76 ± 0.02 for both sound and infested dates respectively.

The result in Table 3 showed correlation between infestation and dry date fruit thicknesses. The result indicated that the correlation was weakly and negatively related. This showed that infestation on the different cultivars was inversely related to some of the fruit characteristics such as fruit flesh thickness. Insect infestation decreases with increase in flesh thickness vice versa. The correlation results obtained is however at variance with the findings of Aisagbonhi (1988) and Aisagbonhi *et al.*, (1988) who reported positive correlations between infestation of marketed date fruits by Indian meal moth, *Plodia interpunctella* (Hübner) (Lepidoptera:Pyralidae), *Oryzaephilus mercator* Fauvel (Coleoptera: Silvanidae) and *Coccotrypes dactyliperda* Fabricius (Coleoptera: Scotytidae) and percentage of date palm fruits with calyx attached.

4. CONCLUSION AND RECOMMENDATIONS

The findings presented clearly indicated that in terms of flesh thickness, "Dan-Mali" is the date cultivar to be promoted for marketing. Whereas, if date is needed based on taste characteristics, then "Digila" dates will be the best for making date bars, date paste or date syrup (Kader and Hussain, 2009) and it is hereby recommended. First larval instars penetrate (bore) easily if fruit-mesocarp is thin and soft. However, only late larva instars can bore through fruit mesocarp if flesh thickness is high and hard. The finding above showed that "Dan-Mali" cultivar having the highest thickness was found to be significantly less infested. Similarly, "Targal" was having the least thickness was infested more. Therefore, "Dan-Mali" cultivar is therefore recommended for cultivation and marketing in the study area. Furthermore, the findings from this study showed that date sweetness does not differ significantly with infestation. This means that chemical composition of dates do not change due to level of infestation.

Further research can be carried out to assess the effect of infestation on the date taste and on date at "rutab" (light brown and soft) stage of fruit development.

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Plate 1: Date palm, *Phoenix dactylifera* tree

Source: http://en.wikipedia.org/wiki/File:Phoenix_dactylifera2.jpg



Plate 2: Healthy date palm fruits

Source: http://en.wikipedia.org/wiki/File:Dattes_deglet.JPG



Plate 3: Infested and heavily frass deposited by date fruit larva, *Loxostege massalis* Walker

Source: Muhammad *et al.* (2014)

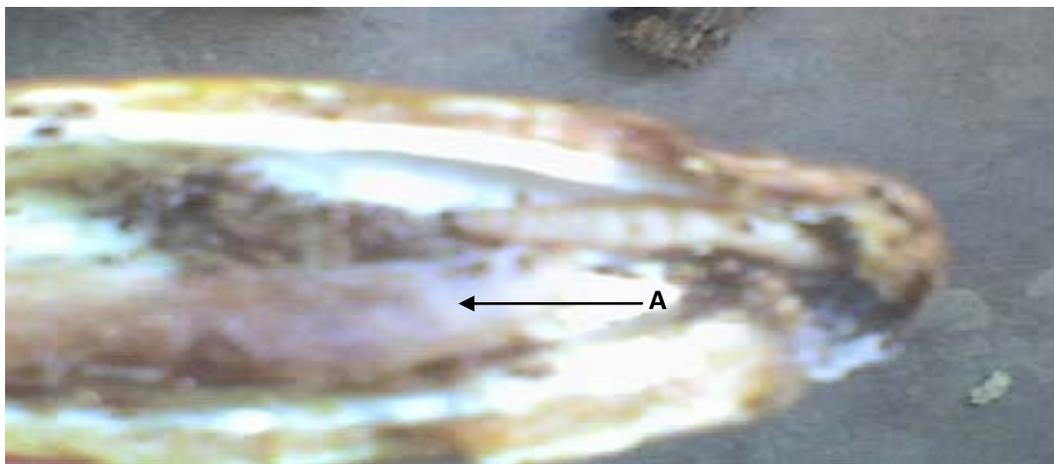


Plate 4: Date fruit infested by date fruit larva (A) [*Loxostege massalis* (Walker)]
Source: Muhammad *et al.* (2014)

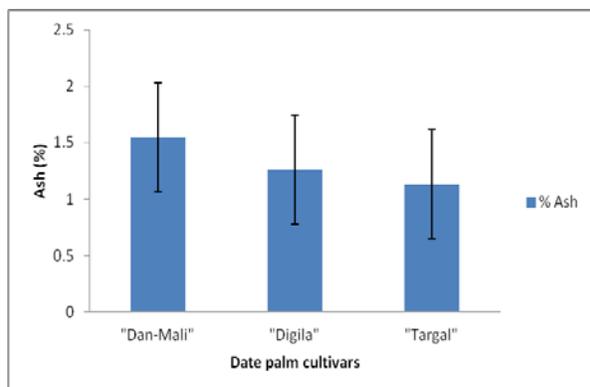
Table 1: Average weight of dried date fruits sampled in Katsina

Date	Weight of 50 Date Fruits (g)	Mean weight (g)
"Dan-Mali"	950.35	19.00
"Digila"	425.11	8.50
"Targal"	381.83	7.63

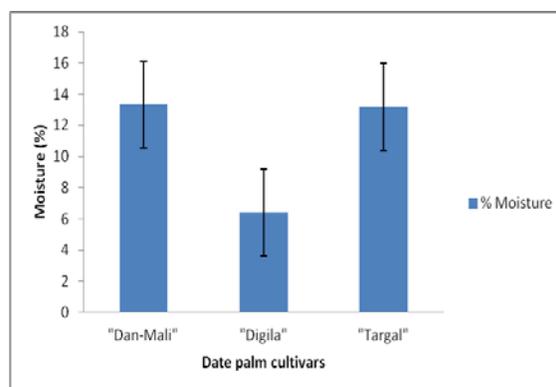
Table 2: Average flesh thickness of the dried date fruits sampled in Katsina

	Date cultivars		
	"Dan-Mali"	"Digila"	"Targal"
Thickness	0.60 ^a	0.45 ^b	0.37 ^c
S.E. (\pm)	0.013	0.009	0.0063
t at 0.05 (2.042)	9.4936	8.0085	7.3390

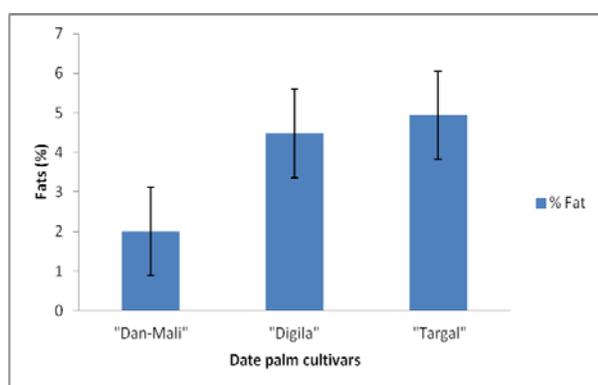
Means followed by unlike letter(s) within the same row are significantly different ($P < 0.05$).



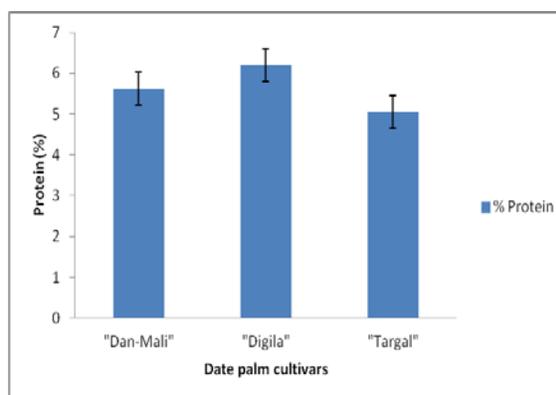
a) Ash



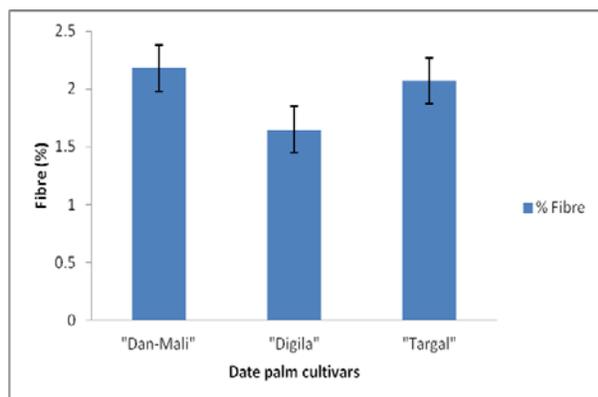
b) Moisture



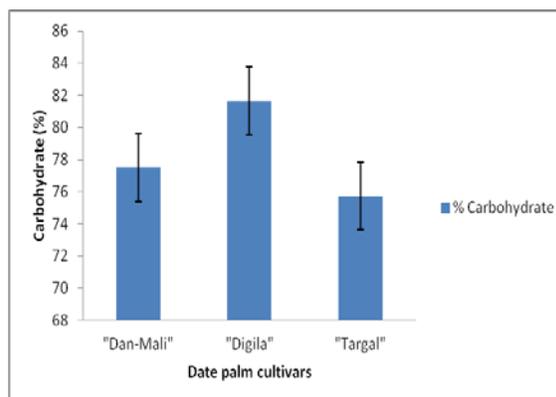
c) Fats



d) Protein



e) Fibre



f) Carbohydrate

Fig.1. Mean nutrient composition of dry date fruit cultivars sampled in Katsina State. Bars represent standard deviation values.

Table 3: Correlation result of fruit thickness in both dry and infested date cultivars.

Cultivar	Mean	Number un infested	Standard deviation	Pearson Correlation	range
"Dan-Mali"	0.6046	48	0.0899	-0.14	0.46
Dan-Mali inf.	0.04	2	0.19795		
"Digila"	0.444	37	0.06855	-0.17	0.33
Digila inf.	0.26	13	0.44309		
"Targal"	0.37	41	0.04492	-0.29	0.21
Targal inf.	0.18	9	0.38809		
