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Occurrence of Fungi on Date Palm Fruits in Mubi Main Market, Adamawa State

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Abstract

The purpose of this study was to determine the occurrence of fungi on date palm fruits in Mubi main market. Two hundred (200) date palm fruits were collected from the sellers in four locations in Mubi main market using simple random sampling. The samples were cut into 3 mm pieces with the aid of sterilized razor blade, surface-sterilized in 1% hypochlorite for 30 seconds, placed on Potato Dextrose Agar and incubated at room temperature for 7 days. Pure cultures of the resulting fungi were obtained from subcultures of the primary plates. These were identified morphologically and microscopically in accordance with standard procedures**.** The result revealed that *Aspergillus niger* had the highest frequency of occurrence in date palm fruit rot with 34.8%, *Rhizopus spp* 22.8% and *Trichophyton rubrum* the lowest 7.6% respectively. Aspergillus species appeared to be the most toxigenic fungi recovered from the dates**.** It is recommended that contaminated dates should be sorted and eliminated to avoid re-infection while washing the dates with clean water prior to consumption should be strongly encouraged by appropriate authorities with the view to checking the spread of these fungi.

Keywords: pathogens, date, blade, sample, clean

Introduction

Phoenix dactylifera is one of the genera which contain a dozen species; all are native to the tropical or subtropical regions of Africa or Southern Asia (Munier, 2007). Date palm is one of the most popular fruits trees in the Middle Eastern countries. World production of dates was estimated to be more than 7.5 million metric tons annually, from a total harvested area of 1.3 million ha. Most of the world's production of dates is provided by countries in the Middle East and North Africa (FAO, 2011). Dates distribution was facilitated by the fact that dates lend themselves perfectly to being carried along as a high-calorie food, with a long-keeping quality (FAO, 2013). Date fruit can be made into juice, vinegar, wine, beer, sugar, syrup, honey, chutney, pickle, paste, dip, and food flavoring (Barreveld, 1993; Glaner *et al.*, 2002). It is an ideal food for all age phases, providing the most important essential nutrients like protein, fiber, carbohydrates, fat and minerals (Al-Farsi *et al*., 2005; Vyawahare *et al.*, 2009). Dates can also be dehydrated, ground and mixed with grain to form a nutritious stock feed. Dates provide a wide range of essential nutrients and are a very good source of dietary potassium. The sugar content of ripe dates is about 80%; the remainder consists of protein, fiber, and trace elements including boron, cobalt, copper, fluorine, magnesium, manganese, selenium, and zinc (Al-Shahib and Marshall 2003).

The date fruit is affected by various pests and diseases, but the nature of the problem varies with geographic location (Howard *et al.*, 2001). The rot of date fruits is widely distributed and causes great losses to farmers and marketers. So far, several studies have been conducted on the microflora present in different date palm varieties and its susceptibility to support the production of aflatoxins (Al Jasser, 2010). Atia (2011) observed that date palm fruits are mostly loaded with a mixture of microbes: bacteria, molds, and yeast but people go ahead eating after clearing the pericarp, while some eat it whole irrespectively of the state of the pericarp. Fungi secrets enzymes and poison which causes decay and loss of the nutritional value of the date palm fruit and makes it unsuitable for consumption. It is important to investigate the inner and outer

surfaces of the fruits before eating in regard to the presence of mycotic agent as well as its suitability for human and consumption. In Mubi, date fruits are being sold by local vendors in which case they store both soft and dry ones in polythene bags, wrapped trays, etc. The fruits are usually sold to consumers un-washed and some do consume it also un-washed. Therefore, the purpose of this study was to examine the occurrence of fungi on dried date palm fruit in Mubi main market.

Materials and Methods

The study was conducted in Mubi main market having four collection points namely *layin yan Dawa, yan Goro, yan Doya* and *yan Taki* respectively. Samples of 200 date palm fruits were collected from the sellers using simple random sampling. These were brought to the laboratory, where all determinations and tests were carried out.

Incidence of Rot of Date Palm Fruits in Storage

This was determined by sorting the date fruits having rot, out of the total number purchased from the market. The incidence of fungal spoilage/rot is expressed in percentage using the formula:

$$\frac{\text{Number of date palm fruits with rot}}{\text{Total number of date palm fruits}} \times 100$$

Isolation and Identification of Fungi

Under aseptic conditions, the infected samples of date fruits were sliced into 3 mm pieces with a sterile razor blade, surface-sterilized in 1% hypochlorite for 30 seconds. The sterilized pieces were rinsed in three changes of distill water and then dried on blotter paper. The sterile piece was then placed on Potato Dextrose Agar (PDA) and incubated at room temperature for 7 days. Colonies of different shape and colors were observed on the plates; a pure culture of each colony type was obtained and maintained. The maintenance was done by sub-culturing each of the different colonies onto the PDA plates and incubated at room temperature for 7 days (Jha, 2015). The fungal isolates were identified using cultural and morphological features such as colony growth pattern, conidial morphology, and pigmentation (Tafinta, *et al.,* 2013).

Pathogenicity Test

Healthy date fruits were obtained and surfaced-sterilized with 1% sodium hypochlorite for 30 seconds and rinsed in three (3) changes of sterile distilled water according to the method of Chukwuka *et al*. (2010). A sterile cork-borer (2 mm in diameter) was used to puncture and then injected with spores' suspension of each isolated fungus in three replicates. Removed tissue was replaced and sterile Vaseline jelly was smeared to completely seal each hole to avoid contamination. The control experiment was set up in the same manner, except that sterile distilled water was used instead of the inocula. The set up was arranged in a completely randomized design. It was incubated for 7 days at room temperature and the isolate was re-isolated and compared with the originally isolated pathogens.

Determination of Severity of Rot

Twenty (20) date fruits were randomly selected, weighed and surface- sterilized with 1% sodium hypochlorite then rinsed in three (3) changes of sterile distilled water. A sterile cork-borer (2 mm in diameter) was used to puncture and inject healthy date fruits with spores' suspension of isolated fungi in three replicates. Likewise, removed tissue from fruit was replaced and sealed with sterile Vaseline jelly. This was then incubated for 7 days after which each fruit was collected and the extent of rot (severity of infection) was measured with caliper and rule, with the aid of hand lens and re-weighed.

Results and Discussion

The result of this study revealed that the fungi associated with date palm fruit in Mubi were *Aspergillus niger*, *Aspergillus nidulans*, *Aspergillus fumigates*, *Rhizopus spp*, *Trichophytom rubrum*. This finding agrees with the works of Anjili, *et al.* (2015), Hashem (2009), Abass (2013), Amal *et al*. (2014), Atia *et al*. (2011) and Al-Jasser (2010) who found similar fungi on date palm fruit. EL-Deeb *et al*. (2006) in their study could not isolate any of the above fungal organisms. These differences could be attributed to variance in geographical location. *Aspergillus niger* had the highest frequency of

occurrence in date palm fruit rot with 34.8%, followed by *Rhizopus spp*. with 22.8 %, *Aspergillus nidulans* with 19.4%, *Aspergillus fumigatus* had 15.3% and *Trichophyton rubrum* had the lowest frequency of 7.6 %. *Aspergillus niger* and *Rhizopus spp* showed a wide distribution occurring in all locations in Mubi main Market (Table 1). The high incidence of *Aspergillus spp.* observed associated with date palm fruit in this study could be as a result of some active principles in the fruits which could favor colonization by this organism. From the public health point of view, the contamination of date palm fruits by molds is significant because of the presence of mycotoxins which can cause severe poisoning, emesis, diarrhea, prostration and even death (Abdulla, 2008). It was observed that the fruits being hawked around, sold in shops or market places were neither covered nor protected in any way from dust or atmospheric contamination and when consumed without any form of cleaning or washing could predispose such unsuspected consumers to imminent mycotic infection.

Table 1: Fungal Pathogens of Date Palm Fruit Rotin Mubi Main Market

Fungi isolated	Frequency Number of Isolated LYD	LYG	LYDY	LYT	Average %
Aspergillus niger	33.3	41.7	25.0	39.3	34.8
Aspergillus nidulans	25.0	20.8	3.1	28.6	19.1
Aspergillus fumigatus	16.7	13.0	12.5	7.1	12.3
Rhizopusspp	21.1	20.3	30.3	17.9	27.3
Trichophytonrubrum	8.3	7.1	4.2	6.2	6.5
Total					**100**

Key: LYD = LayinyanDawa; LYG = LiyinyanGoro; LYDY = LiyinyanDoya; LYT = LayinyanTaki

The severity of Fungal Pathogens on Date Palm Fruit

Aspergillus niger had the higher severity with 25.95% while the lowest was *Trichoptonrubrun* with 11.79 % (Table.2). The presence of *Aspergillus* in the study area shows that there is fear of consumption of aflatoxins that have a serious health implication, as they are highly toxic and carcinogenic (AOAC, 2002; Shenasi et al., 2002), thus rendering the fruits unfit for human and animal consumption. This result agrees with Hassan *et al*. (2005) who found that the most abundant genus of fungi associated with date palm fruits collected from Morocco was *A. niger*. Similarly, Hashem (2009) isolated 39 species of fungi from local varieties grown in Saudi Arabia and concluded that *A. Niger* and *Fusarium*s pp were the most predominant fungal pathogen associated with date palm fruit. Some reports have shown that the severity and incidence of fruit rots are affected by temperature and the ripeness of the fruit (Dixon *et al*., 2003; Dixon *et al*., 2004).

Table 2: Severity of Fungal Pathogens (Lesion size mm) on Date Palm Fruit

SNO	Fungi isolates	% Occurrence
1.	*A.niger*	25.95
2.	*A. nidulans*	17.40
3.	*A. fumigatus*	22.20

4.	*Rhizopus spp.*	22.66
5.	*Trichophytonrubrum*	11.79

Conclusion

Five pathogenic fungi were identified which were responsible for the rot of date palm fruits in the study area. *Aspergillus spp* was the most predominant fungal species isolated on date palm fruit from Mubi. Aspergillus species appeared to be the most toxigenic fungi recovered from the dates**.** It is recommended that contaminated dates should be sorted and eliminated to avoid re-infection while washing the dates with clean water prior to consumption should be strongly encouraged by appropriate authorities with the view to checking the spread of these fungi.

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