Al-Mustansiriyah Journal of Science
ISSN: 1814-635X (print), ISSN:2521-3520 (online)
Volume 29, Issue 4, 2018
DOI: http://doi.org/10.23851/mjs.v29i4.428

Research Article **Open Access**

Survey of the Fungi that Infect Imported Carrot (*Daucus Carota L.*) in the Areas of Baghdad

Moayad Salh Hussin*
Department of Biology, College of Science, Mustansiriyah University, IRAQ
*Correspondent author email: moayad.Sa@uomustansiriyah.edu.iq

ArticleInfo

Received
11/12/2017

Accepted
14/05/2018

Published
05/05/2019

Abstract

An extensive survey of fungi associated with post-harvest *Carrot daucus* Carota L. degradation in different parts of the Baghdad market. Samples were collected from three different regions of Adhamiya, Kadhimiya and Sadiyah. Five fungal species, such as, *Aspergillus niger*, *Alternaria radicina*, *Sclerotinia sclerotorum*, *Geotrichum candidum* and *Rhizoctonia carotae*, which isolated from the decayed samples. In this context, *Alternaria radicina* showed the highest Frequency percentage about 23.3%. Both *Sclerotinia sclerotiorum*, *Aspergillus niger*, *Geotrichum candidum* at 20% While *Rhizoctonia carotae* showed the lower frequency at 16.7%. Pathogenic test showed that all isolated fungi were pathogenic to host roots Storage. However, *Aspergillus niger* was found to be more pathogenic to carrots resulting in a rapid disintegration of infected roots by 90%during the incubation period. While *Alternaria radicina, Sclerotinia sclerotorum*, was 80% followed by *Geotrichum candidum* 75% and *Rhizoctonia carotae* less than 70%.

Keywords: Post-harvest fungi, Carrot, Chloramphenicol, pathogenicity, storage.

الخلاصة

دراسة استقصائية واسعة النطاق للفطريات المرتبطة بتدهور الجزر بعد الحصاد في أجزاء مختلفة من أسوق بغداد. تم جمع عينات من ثلاث مناطق مختلفة من الأعظمية والكاظمية والسيدية. تم عزل خمسة أنواع فطرية ، *Alternaria radicina, Sclerotinia sclerotorum, Geotrichum candidum, Aspergillus niger,* و *Rhizoctonia carotae*، من العينات الفاسدة. في هذا السياق، أظهرت *Alternaria radicina* أعلى تردد من ٢٣,٣٪. كلا من *Sclerotinia sclerotiorum, Aspergillus nige, Geotrichum candidum* في ٢٠٪ في حين اظهر *Rhizoctonia carotae* أدنى تردد ١٦,٧٪. كشفت الاختبارات المسببة للأمراض أن جميع الفطريات المعزولة كانت مسببة للأمراض لاستضافة الجذور التخزين. ومع ذلك، وجد *Aspergillus nige* أن يكون أكثر مسببة للأمراض إلى الجزر مما أدى إلى تفكك سريع للجذور المصابة بنسبة ٩٠٪ خلال فترة الحضانة. في حين أن *Alternaria radicina* ، *Sclerotinia sclerotorum* ، كان ٨٠٪ تليها *Geotrichum candidum* ٧٥٪ و *Rhizoctonia carotae* أقل من ٧٠٪.

Introduction

Fruits and vegetables are of great commercial and nutritional importance. So that Play a necessary role in human nutrition by providing some fundamental materials like minerals and Vitamins, also essential in a human diet daily, that ability to help save healthy vegetables well consumed on large scale. The most important factors that adversely affect the economic value of fruit and vegetables is the low shelf life. Leading to many problems, Most notably the pathogen activity[1]. Vegetables and Fruits are exposed to microbial infection by connect with soil, water and dust and through working at harvest or during the postharvest process. That makes them carry a large domain of microorganisms included human and plant pathogens[2]. Carrot {*Daucus Carota* L.} is the important crops refer to Umbelliferae family. Carrot roots Use for the first period for medical purpose then gradually use it as food of the total 39 vegetables and Fruits place carrots rank 10 in nutrition value[3]. Carrots are a perfect source of nutritional fiber and whit mineral molybdenum and are rarely found in many vegetables. beneficial in the

metabolism of carbohydrates and fats also important for iron absorption. It is a good source of manganese and magnesium which needed for bone and protein, creating new cells, activating vitamin B, nerves, ergonomic muscles, blood clotting, energy production[4] high percentage of carrot fruits are lost annually due post-harvest degradation Caused by fungal pathogens[5]. The possibility of transmission of field fungus to the store through the contamination of containers with spores resulted in the spread of a large number of fungi and the result of mismanagement after the harvesting process in terms of transport, storage and marketing[6]. The first report of fungi pathogens that affect the carrot due to poor storage conditions were *Botrytis cinerea* causes Gray Rot[7]. *Chalara elegans* causes black root rot[8]. *Geotrichum candidum* causes Sour rot[9]. *Sclerotinia sclerotiorum* causes cottony soft rot[10]. *Rhizoctonia carotae* causes crater rot[11]. *Alternaria radicin*a causes black rot[12].

The current study highlights fungi associated with carrot rot storage in Baghdad, the current study highlights fungus associated with carrot rot storage in Baghdad, and isolate and identify post-harvest fungi that caused decay of carrot rot.

Methods and Materials

Samples Collection

Carrot samples collected from Three markets in the city of Baghdad, Adhamiya, Kadhimiya and Sadiyah which were surveyed. The samples were collected in sterilized plastic containers then transfer to the laboratory.

Isolation and Identification

The sample first surface sterilized by washing under runner faucet water to remove dirt such as the sand .cut infected parts and take samples with dimensions (0.5 cm) sterilized surface with 1% sodium hypochlorite solution for 1 minute and then wash with distilled water three times leave until drying, (0.5 cm) distributed on Petri dishes containing Potato Dextrose Agar (PDP) supplemented with Chloramphenicol 250 mg / L. Three pieces were put in the dish with three replicates and incubated at 27 ˚C±2.for 7 days. a short part of mycelium from each fungus colony was transferred aseptically unto fresh plate containing the medium used. The fungi were purified by repeated sub-culturing and repeated several times until pure fungi were isolated. Using sterile inoculating needle, minute part of each isolate was taken and mix at the center of a clean microscopic slides containing drop of Lactophenol cotton blue stain, enveloped with cover slips and observed under the microscope. Identification was made with reference to standard textbooks such as[13][14]. The fungal frequency was calculated according the following equation:

$$\text{Percentage of species frequency} = \frac{\text{colonies number of species}}{\text{total number of species colonies}} \times 10$$

Pathogenicity test

Fresh and healthy was washed from the carrot with tap water and the sterilized superficially with 0.1% sodium hypochlorite solution 2-3 Minutes. Then wash carrot with water until the odor disappears, and the cylindrical cores of the tubers are removed in diameter 5mm by cork borer. Different fungal isolates were inserted into puncture and closed with paraffin wax to prevent spores from spreading out. Control was used without fungal isolates Figure 1, Treatment tubers were placed separately in sterile polythene bags and incubated at 27 ± 2 ˚C for 20 days. Samples are examined from time to time and the appearance of rot is observed until the end of the incubation time[15].

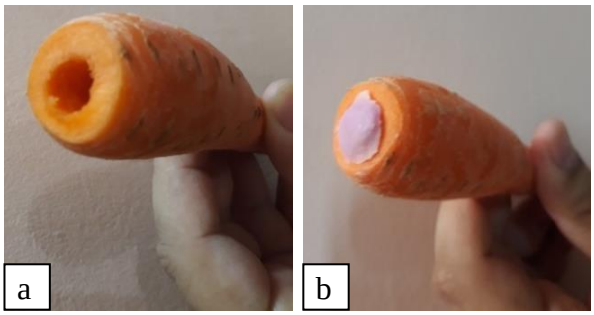

Figure 1: (a) Make a gap (b) place the isolates inside with cover by wax.

Results and Discussion

Isolation and Identification

The results of isolation and identification, as shown in Table 1, 30 isolates of fungi, divided into 5 fungal species, the most common species frequency were *Alternaria radicina* Figure 2, which was present in all three Regions with a frequency of 23.3%, followed by *Sclerotinia sclerotiorum* Figure 3, which showed Sour rot, *Aspergillus nige* Figure 4 which showed black rot, *Geotrichum candidum* with a frequency 20% For each of them , and then *Rhizoctonia carotae* which showed crater rot and frequency 16.7%. These results largely coincide with the results of researchers interested in isolating fungi from the carrot in India[15], in Nigeria[16], in turkey[11], in Saudi Arabia[8] find that *Aspergillus niger* occurred most frequently .This results agreed also with the findings of[17] who reported that the species of *Rhizopus* and *Aspergillus* occurred mostly frequently of total isolates.

Table 1: Fungus frequency of Carrots collected from three locations in Baghdad

Fung	Regions or areas				
	Adhamiya	Kadhimiya	Sadeya	Total	Frequency %
Geotrichum candidum	3	1	2	6	20
Rhizoctonia carotae	1	1	3	5	16.7
Aspergillus niger	2	2	2	6	20
Sclerotinia sclerotiorum	1	2	3	6	20
Alternaria radicina	3	2	2	7	23.3
Total	**10**	**8**	**12**	**30**	**100**

Figure 2: *Alternaria radicina* (40x).

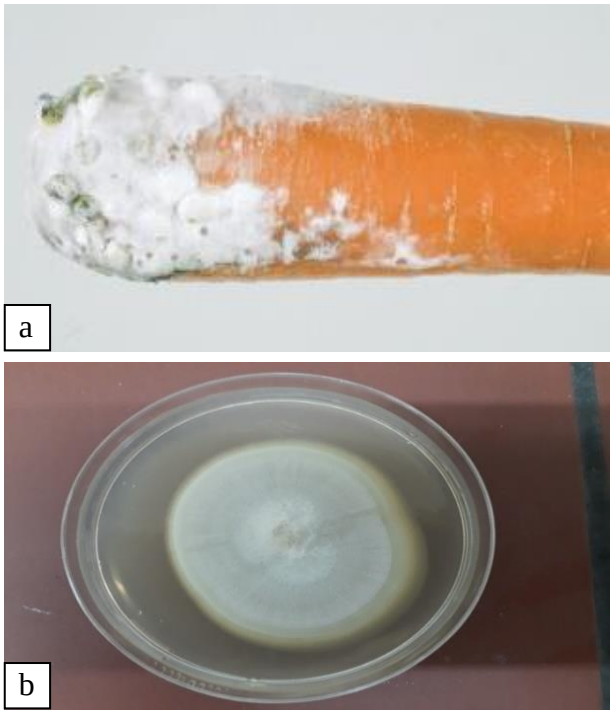

Figure 3: *Sclerotinia sclerotiorum* on (a) carrot on (b) PDA.

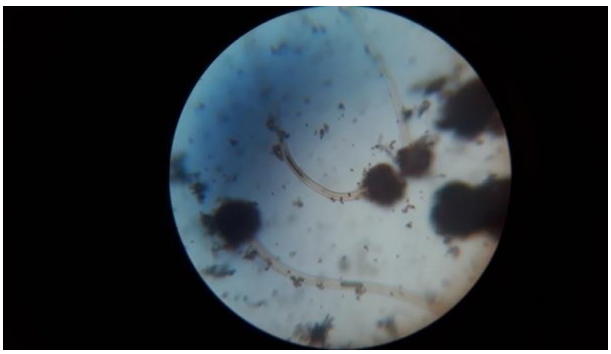

Figure 4: *Aspergillus niger* (40X).

Pathogenicity test

All the isolate was pathogenic on carrot roots. The percentage of pathogenicity ranged from 70 % to 90 % Table 2. Among all pathogenic fungal, *Aspergillus niger* was found to be relatively very virulent Figure 5 followed by *Alternaria radicina, Sclerotinia sclerotiorum* , *Geotrichum candidum*, and *Rhizoctonia carotae*. The inoculated pathogens on pathogenicity test cause the rotting of special host roots. Their percentage of rotting was 90 %, 85 % , 80 %, 75% and 70 % respectively.

This result corresponds to its conclusion [15] regarding the most pathogenic isolation.

Figure 5: *Aspergillus niger* after incubation period 20 days.

Table 2: Pathogenicity of the isolates on carrot and radish roots

Fung	Percentage of rotting in carrot %
Aspergillus niger	90
Alternaria radicina	80
Sclerotinia sclerotiorum	80
Geotrichum candidum	75
Rhizoctonia carotae	70
Control	Zero

Conclusion

In this study revealed that five types of fungi were found to cause carrot rot during the period of storage or transport operations and marketing in the areas of the city of Baghdad. These pathogens lead to tremendous loss not only in terms of quantity but also reduce their economical and nutritional value. Some of these fungi are able to produce mycotoxins that pose a danger to the health of consumers. Urgent attention must be given to this situation, thereby increasing the economic yield of the product. This will ensure a significant contribution to the crop in food supply and the national economy.

References

[1] Zhu, S. J. Non-chemical approaches to decay control in postharvest fruit. In: Noureddine, B., Norio, S. (Eds.), Advances in Postharvest Technologies for Horticultural Crops. Research Signpost, Trivandrum, India, 2006, pp. 297–313.

[2] Eni, A. O., Oluwawemitan, T. O. and Solomon O. U, Microbial quality of fruits and vegetables sold in Sango Ota, Ogun State, Nigeria. *African Journal of Food Science*, 2010, 4(5): 291-296.

[3] Acharya, U.R., Mishra, M., Patro, J. and Panda, M.K. Effect of Vitamins C and E on Spermatogenesis in Mice Exposed to Cadmium. *Reproductive Toxicology*, 2008, 25: 84-88.

[4] Tucker, K.L, Hannan, M.T, Chen, H, Cupples, L.A, Wilson, P.W, Kiel, D.P. Potassium, magnesium, and fruit and vegetable intakes are associated with greater bone mineral density in elderly men and women. *Am J Clin Nutr*., 1999, 69(4): 727-736.

[5] Mahale, D. P., Ranjana, G. K., and Varsha, K. V. Microbiological Analysis of street vended Fruit juices from Mumbai city India. *Internet Journal of Food Safety*, 2008, 10: 31-34.

[6] Bukar, A., Mukhtar M.D. and Adamu S., Isolation and identification of postharvest spoilage fungi associated with sweet oranges traded in kano metropolis. *Bayero J. Pure Appl. Sci*., 2009, 2: 122-124.

[7] Aktaruzzaman, Md., Joon-Young, K., Sheng-Jun X., and Byung-Sup K. First Report of Postharvest Gray mold rot on Carrot Caused by *Botrytis cinerea* in Korea. *Res. Plant Dis*., 2014, 20(2): 129-131.

[8] Elsayed F. Abd_Allah1, Abeer Hashem, Ali H. Bahkali and Asma AL-Huqail. First report of black root rot disease (Thielaviopsis basicola) of carrot in Saudi Arabia. *African Journal of Microbiology*. 2011.

[9] Yong-Ki, K., Taek-Soo, K., Hong-Sik, Sh., Kyung-Seok, P., Wan-Hae, Y., Sung-Jun, H., Chang-Ki, Sh., Jeong-Soon, K., Jong-Ho, P., Eun-Jung, H., Min-Ho, L. and Hyeong-Jin J. First Report of Sour Rot on Post-harvest Oriental Melon, Tomato, Cucumber, Potato, Pumpkin and Carrot Caused by *Geotrichum candidum. Res. Plant Dis*, 2011, 17(2) : 232−234 .

[10] Kora, C., McDonald, M.R., and Boland, G.J. Epidemiology of *sclerotinia* rot of carrot caused by *Sclerotinia sclerotiorum. Can. J. Plant Pathol*., 2005, 27: 245–258

[11] Kurt S., Soylu E. M., Soylu S. and Tok F. M. First report of crater rot caused by *Rhizoctonia carotae* on Carrots (*Daucus carota*) in Turkey. *Plant Pathology*, 2005, 54, 251.

[12] Farrar, J.J., Pryor B.M., and Davis R.M., *Alternaria* Diseases of Carrot. *Plant Disease*. 2004, 88, 776 – 784.

[13] Barnett, H. L., and Hunter, B. B. Illustrated genera of imperfect fungi. St. Paul: The American Phytopathological Society, 1998.

[14] Erwin, D. C., and Ribiero, O. K. Phytophthora diseases worldwide. St. Paul: The American Phytopathological Society.١٩٩٦ .

[15] Khatoon A, Mohapatra A, Satapathy KB.Fungi Associated with Storage Rots of Colocasia esculenta L. Tubers in Bhubaneswar City, Odisha. *British Microbiology Research Journal*. 2016,12(3): 1-5.

[16] Ewekeye T. S., Oke O. A., Quadri A. I.; Isikalu A. O., Umenwaniri M. O., and Durosinmi M. L.Studies on Post Harvest Deterioration of Some Fruits and Vegetables in Selected Markets in Lagos State, Nigeria، *American Journal of Research Communication*, 2013, 1(10): 209-223

[17] Adebayo,B.C .,Tayo, N. Odu, Esen ,C.U. and Okonko , T.O. Microorganisms associated with spoilage of stored vegetables in Uyo metropolis, Akwa Ibom State, Nigeria. *Nature and Science*, 2012, 10(3): 23-32.