

Decline of Date Palm Offshoots Infected with *Chalara paradoxa* in Riyadh Region

*Y.Y. Molan, **R.S. Al-Obeed, **M.M. Harhash, and *S. El-Husseini,

*Plant protection- **Plant production- College of Agriculture-King Saud University
P.O. Box 2460 Riyadh 11451, Saudi Arabia

(Received 20/12/1422; accepted for publication 22/6/1423)

Abstract. The objective of this study was to investigate the decline of new transplanted date- palm (*Phoenix dactylifera* L.) offshoots in new orchards. Samples of diseased rachis, and fronds were collected from three to five years old date- palm offshoots in an orchard in Horameila area. Symptoms on the date- palm offshoots included dry bone of outer leaves with crack and break of blade apart from fiber tissues with developed fungal black spores on the infected tissues. The sampled date- palm offshoots were the following cultivars: Naboot saif, Barhi, Nabtat Ally, Sagie, Meanifi, Roshody, Maigfizi and Rothan. A fungus was isolated from the symptomatic tissues of the collected samples on Potato Dextrose Agar medium plates, which were incubated at room-temperature. Slides prepared from the isolated fungus were examined under the light microscope and the fungus was identified as *Chalara paradoxa*. Pathogenicity of the fungus was tested in fronds of date palm-offshoots of some of the previous cultivars. Disease severity index was determined using a scale ranged from (0-5). Results of the pathogenicity test indicated significant susceptibility differences among the tested cultivars to *C. paradoxa*, the cause of black scorch in date palm trees.

Introduction

Date palm (*Phoenix dactylifera* L.) is an important tree in Saudi Arabia for fruit production and ornamental purpose Al-Mana, *et al* [1]. *Chalara paradoxa* (De Seyn.) Sacc. (Synonym= *Thielaviopsis paradoxa*) causes a wide range of disease symptoms on palms including black scorch. The fungus invades young emerging fronds causing a black scorch. *C. paradoxa* has a wide host range including several ornamental palms and many economically important host plants such as cotton (*Gossypium hirsutum* L.), soybean (*Glycine max* L.), peanuts (*Arachis hypogea* L.), and other legumes Chase and Broschat [2] and Singleton *et al* [3]. Sahan [4] found that eight fungi including *Chalara paradoxa* were causing deterioration of date palm trees in the middle of Iraq. Suleman, *et al* [5] indicated that Date –palm trees were infected with *Chalara radicularis* and *C. paradoxa* in parts of Kuwait where drought and salinity prevail, opportunistic pathogens such as *C. paradoxa* became aggressive and cause serious

damage to date palm. Djerbi [6] demonstrated that black scorch was recorded on date palm in Egypt, Tunisia, Algeria, Saudi Arabia, Iraq, Mauritania and U.S.A.

While Khalil, *et al* [7] indicated that the cause of the observed decline of date palm trees in Libya was not known. Edongali, *et al* [8] found that the most common fungi associated with decline of date palm trees in the same country were, *Fusarium solani*, *Rhizoctonia solani*, *Thielaviopsis paradoxa*, *Alternaria* spp and other parasitic nematodes. Saleh *et al* [9] found that the most important diseases at costal region, besides Al- Hofra, and Sabha regions at southern area in Libya were florescence root, heart rot, and black scorch. He also found *Thielaviopsis paradoxa* associated with the previous diseases.

In the Kingdom of Saudi Arabia, Al-Rokibah *et al* [10] indicated that artificial inoculation of date palm seedlings of 10 different cultivars showed that Nabtat Ally and Om- Khashab were more susceptible than the other tested cultivars. Djerbi [11] demonstrated that the large distance contamination with pathogenic fungi occur by offshoots, whereas the small distance contamination arise with infested soil, irrigation water and root contact between trees. Abdulsalam *et al* [12] demonstrated that the most common diseases of date palm including black scorch caused by *Thielaviopsis paradoxa* were recorded in the Eastern Province of Saudi Arabia.

The objectives of this study were to understand the decline problem of date-palm offshoots in new plantations to identify the fungus causing black scorch and death of date- palm offshoots and to evaluate the susceptibility of five date –palm cultivars to inoculation with *Chalara paradoxa* under laboratory conditions.

Materials and Methods

Random samples of diseased rachis, and frond were collected from date- palm offshoots in Horameila area, Riyadh region, Saudi Arabia, during late summer 2001. Tissues from the margins of lesions on rachis and frond were surface sterilized with 2% sodium hypochlorite solution for 3 min, rinsed in sterile distilled water, allowed to dry and plated on Difco Potato Dextrose Agar (PDA), containing streptomycin sulfate (50 mg/L). Fungal colonies that emerged from the tissue pieces were purified through single sporing. A single spore from each colony was placed on 2% water agar and incubated at room temperature 23 C. Thereafter, single spore was transferred to PDA slants and stored at 4 °C, Baudion [13]. The fungus was then examined and identified with a light microscope according to Watanabe [14], Singleton *et al* [3] and Barnett and Hunter [15].

Nine fresh cuttings of the middle part, 25 cm in length of the offshoot rachis of each of the following cultivars, Barhi, Sagie, Succary, Khalas, and Naboot saif were obtained from the Agriculture Experimental Station of King Saud University. These

cuttings were surface sterilized with 2% sodium hypochlorite solution for 5 min., allowed to dry and sealed with Para film at the end of cuts. A 8 mm in diameter and 4 mm deep wound (hole) was made at the center of each cuttings of the offshoot frond, and inoculated with a PDA disc (8mm in diameter), which was cut from a 10 days old culture plate of *C. paradoxa*. Agar discs which were containing conidia, chlamydospores and mycelial fragments, were inserted into the hole cuts, covered with small pieces of wet, sterile cotton and wrapped with Para film Molan and El-Hussieni [16]. Three other cuttings for each tested cultivar were inoculated with PDA agar plug without pathogen served as control. All cuttings were kept in plastic bags at room temperature (23 °C).

The cotton and Para film were removed from the three cuttings of each of the tested cultivars after 2,3, and 6 wks, respectively. After that cuttings were split- open and the size of the damaged tissues around the point of infection were measured 2,3, and 6 weeks, post inoculation by measuring the area of the affected tissues (cm²), using a leaf area apparatus.

Disease severity index (damage necrotic or dark-brown area around the point of infection) was also recorded 6 weeks after inoculation using a scale (0-5), where 0= No apparent infection, 1= 1-10% damage necrotic or dark – brown area around the point of infection, 2= 11-25%, 3=26-50%, 4=51-75%, and 5= 76-100% Baudion [13].

Data were analyzed using the Statistical Analysis System (SAS Institute, Inc.1988) [17]. Analysis of variance and Least Significance Difference values (LSD) (P= 0.05) were used to detect differences among treatment means.

Results and Discussion

A decline of date- palm offshoots (*Phoenix dactylifera* L.) in new plantations, showing chlorosis symptoms of young leaves with dark-brown to black irregular lesions developed along the petiole and confer a torched appearance to tissue, and dark-brown develop lesions on external and internal tissues was observed. Offshoots collapse and dry-bone with abundant chlamydospores production in the tissue that confers the dark color, (Plate 1) was noticed. The fungus associated with the decline of date- palm offshoots was identified as *Chalara paradoxa* (De Seyn.) Sacc. (Synonym= *Thielaviopsis paradoxa*).

Positive cutting inoculation of the middle part of offshoot rachis of each of the following cultivars, Barhi, Sagie, Succary, Khalas, and Naboot saif was detected 2 and 3 wks after inoculation. Light –brown areas were obvious on the internal tissues after splitting the cutting of each cultivar but varied in the area of the affected tissues. Plate 2

showed dark –brown or black area that developed on the external and internal tissues 6 weeks after inoculation with the fungus. Abundant conidia and chlamydospore production were also observed (examined with a light microscope) on the internal tissues after splitting (opening) the inoculated cuttings. Control cuttings of each of the tested cultivars remained healthy without any disease symptoms or pathogen signs.



Plate 1. Typical symptoms of leaf scorch caused by *C. paradoxa*: (A): A decline of date- palm offshoots in new plantations in Horameila area, (B): Close-up of advanced symptoms on frond showing dry-bone and abundant chlamydospores production.

Results of the cutting infection method which were presented in (Table 1) are showing different degrees in the lesion size around the point of infection for all date-palm tested cultivars. The susceptibility of Sagie offshoots cuttings to infection by the fungus after 2,3,and 6 wks, was highly significant (at $P = 5\%$) and recorded the highest

values in lesion size, with average of 12.33, 17.83 and 27.00 cm² compared with Barhi cultivar (less susceptible) with average lesion size of 4.93, 6.00, and 8.67 cm², respectively.

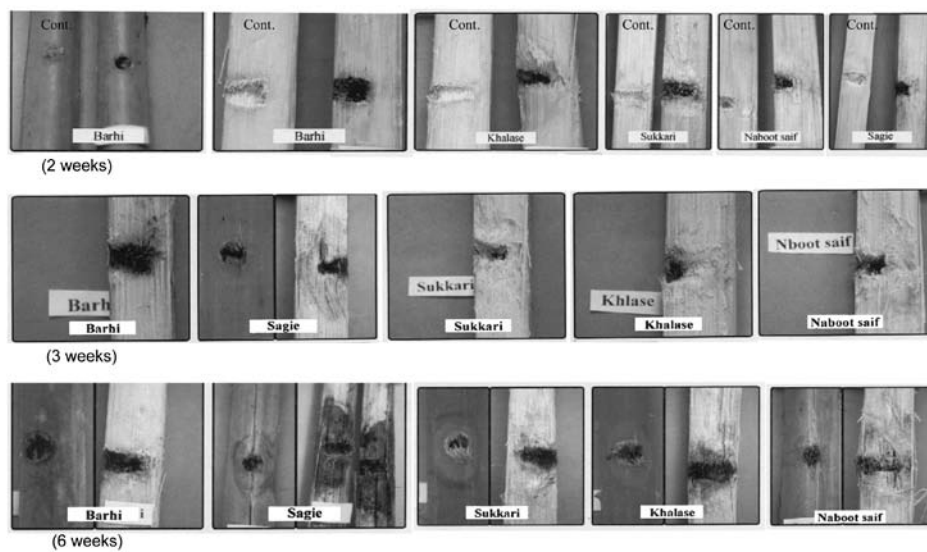


Plate 2. Cuttings of date palm cultivars, showing reddish-brown lesions developing on external tissues around the point of infection (left), abundant conidia and chlamydo spores production of *C. paradoxa*, on internal tissues that confer the dark color 2, 3 and 6 wks after inoculation (right).

Disease severity index (DSI) was recorded 6 weeks after inoculation with *C. paradoxa* (Table 1). The statistical analysis of disease severity index showed highly significant differences among tested cuttings for all cultivars. Sagie cultivar recorded the highest value in disease severity index with average of 4.00 followed by Naboot saif, Khalas and Succary with average of 3.00, 2.66 and 2.33, respectively. Barhi cultivar was less susceptible to *C. paradoxa* with an average disease severity of 1.00. The trend found in this study is similar to what was reported Linde and Smit, [18] who reported that Date-palm leaves inoculated with an agar plug of *Chalara radicularis* culture at the leaf base (7mm wound), became necrotic, wilted rapidly and died 3 months after inoculation.

Table 1. Disease Severity Index (DSI) and area of affected tissues on cuttings of date palm cultivars, 2,3 and 6 weeks after inoculation with *Chalara paradoxa*

Tested date- palm cultivars	*Mean lesion area (cm ²)			**DSI
	2 weeks after inoculation	3 weeks after inoculation	6 weeks after inoculation	6 weeks after inoculation
Barhi	4.93 <i>c</i>	6.00 <i>c</i>	8.67 <i>c</i>	1.00 <i>d</i>
Sagie	12.33 <i>a</i>	17.83 <i>a</i>	27.00 <i>a</i>	4.00 <i>a</i>
Succary	9.83 <i>b</i>	13.16 <i>b</i>	16.91 <i>b</i>	2.33 <i>c</i>
Khalas	9.50 <i>b</i>	12.33 <i>b</i>	18.00 <i>b</i>	2.66 <i>bc</i>
Naboot Saife	10.50 <i>b</i>	14.16 <i>b</i>	19.25 <i>b</i>	3.00 <i>b</i>
<i>LSD 0.05</i>	1.6418	2.2717	2.6887	0.6431

*Cuttings split-open after inoculation and recorded six values of lesion size (cm²) per treatment (average of three replicates).

** Disease Severity Index is on a scale of 0-5, where 0= no apparent infection, 1= 1-10%, 2=11-25, 3=26-50%, 4=51-75%, 5= 76-100% of damage necrotic or dark-brown area around the point of infection Values followed by the same letters in columns are not significantly (P= 0.05) different.

Damage area around the point of infection of the same cuttings of the tested cultivars was increased progressively with time. There was a rapid increase in damage area around the point of infection with *C. paradoxa*, reaching a peak value within 6 weeks. Table 1 showed that Sagie was the most susceptible cultivar with the average disease severity index of 4 whereas Barhi cultivar was considered the least susceptible to the infection with *C. paradoxa* based on its average disease severity index of 1.

C. paradoxa could become aggressive and causes serious damage to date- palm (*Phoenix dactylifera* L.) offshoots in new plantations in the Riyadh region.

References

- [1] Al-Mana, F.A., Hamady, F.A., Bacha, Abdellrahman, A.O. "Improving Root Development on Ground and Aerial Date Palm Offshoots." *Principes*, 40 (1996), 179-181.
- [2] Chase, A.R. and Broschat, T.K. *Diseases and Disorders of Ornamental Palms*. St. Paul, Minnesota, USA: The American Phytopathological Society, 1991.
- [3] Singleton, L.L., Mihail, J.D. and Rush, C.M. *Methods for Research on Soil-bore Phytopathogenic Fungi*. St. Paul, Minnesota: The American Phytopathological Society, 1992.
- [4] Sahan, A.R.T. "Study on the Fungi Causing Decline of Date Palm Trees in Middle of Iraq." *The Second International Conference on Date Palm*. United Arab Emirates University. Al Ain, UAE. (2001), 72.
- [5] Suleman, P., Al-Musallam, A. and Menezes, C.A. "The Effect of Solute Potential and Water Stress on Black Scorch Caused by *Chalara paradoxa* and *Chalara radicola* on Date Palms." *Plant Dis.*, 85 (2001), 80-83.
- [6] Djerbi, M. *Diseases of the Date Palm (Phoenix dactylifera L.)*. Regional Project for Palm and Dates Research Center in the Near East and North Africa. (1983), 106.
- [7] Khalil, J.A., Edongali, E.A. and Saleh, M. N. "Decline Disease of Date- palm Trees (*Phoenix dactylifera* L.) in Libya." *The Second Symposium on the Date Palm In Saudi Arabia*. Vol. II. 487-490. Date Palm Research Center King Faisal University, Al-Hassa. (1986), 642.
- [8] Edongali, E.A., Khalil, J.A. and Saleh, M.N. "Decline of Date Palm Trees in Libya." *The Third Symposium on the Date Palm in Saudi Arabia*. Vol. II. 61-66. Date Palm Research Center, King Faisal University, Al-Hassa (1993), 632.
- [9] Saleh, M. N., Keshera, B., Edongali, E.A. and Khalil, J.A. "Some Fungi Diseases Attacking Date Palm *Phoenix dactylifera* L.) in Libya." *The Second Symposium on the Date-palm in Saudi Arabia*. Vol. II. 480-486. Date-palm Research Center King Faisal University, Al-Hassa (1986), 642.

- [10] Al-Rokibah, A.A., Abdallah, M.Y. and El-Fakharani, Y.M. "Effect of Water Salinity on *Thielaviopsis paradoxa* and Growth of Date Palm Seedlings." *Bulletin of Faculty of Agriculture, University of Cairo*. 47:(1998) 639-648.
- [11] Djerbi, M. "Diseases of the Date Palm: Present Status and Future Prospects." *Scientific Research Agriculture Sciences*, 3 (1998), 103- 114.
- [12] Abdulsalam, K.S., Elsaadany, G.B., Salama, E.A., Abdel-Megeed, M.I., Rezk, M.A., Mahgoup, M.S. and Magboul, A.M. "Present Status of Date Palm Pests and Their Control in Eastern Province of Saudi Arabia." *The Third Symposium on The Date Palm In Saudi Arabia. Vol. II. 107-124*. Date Palm Research Center King Faisal University, Al-Hassa (1993), 632.
- [13] Baudion, A.B. *Laboratory Exercises in Plant Pathology: An Instruction Kit*. St. Paul, Minnesota : The American Phytopathological Society, 1988, 314.
- [14] Watanabe, T. "Fungi Isolated from the Underground Parts of Sugarcane in Relation to the Poor Rationing in Taiwan, Hyphomycetes." *Trans. Mycol. Soc. Jpn.*, 16 (1975), 149-182.
- [15] Barnett, H.L. and Hunter, B.B. *Illustrated Genera of Imperfect Fungi*. 4th ed. St. Paul, Minnesota : The American Phytopathological Society, 1998, 218.
- [16] Molan, Y.Y. and El-Hussieni, S. "Pestalotiopsis Leaf Spot of Date-palm (*Phoenix Dactylifera* L.) in Saudi Arabia." *Alex. Sci. Exch.*, 20 (1999), 189-200.
- [17] SAS Institute. *SAS/STAT User's Guide Release 6.03*. Cary, NC: SAS. Institute. Inc., 1988, 1028.
- [18] Linde, C. and Smit, W.A. "First Report Caused by *Ceratocystis Radicicola* on Date Palm in South Africa." *Plant Dis.*, (1999) D-1999-0721-01n.

تدهور فسائل نخيل التمر المصابة بالفطر كلارا بارادوكسا بمنطقة الرياض

يونس مولان*، راشد العبيد**، محمد حرحش**، صلاح الحسيني*
قسم وقاية النبات*، قسم الإنتاج النباتي**، كلية الزراعة، جامعة الملك سعود
ص. ب. ٢٤٦٠ الرياض ١١٤٥١، المملكة العربية السعودية

(قدم للنشر في ١٢/٢٠ / ١٤٢٢ وقيل للنشر في ٦/٢٢ / ١٤٢٣ هـ)

ملخص البحث. تهدف الدراسة إلى التعرف على ظاهرة تدهور وموت فسائل نخيل التمر المنقولة حديثاً إلى مكانها المستديم عند إنشاء البساتين الحديثة. تم جمع عينات من سعف نخيل مصاب من بستان مزروع حديثاً بمنطقة حريملاء، يتراوح عمر الفسائل فيه ما بين ٣-٥ سنوات من أصناف (نبوت سيف- البرحي- نبتة علي - صقعي - منيفي - أرشودية - مقفزي - روثنان) يظهر عليها أعراض ابيضاض وجفاف الأوراق الخارجية مع تهتك وتكسير في أنسجة عنق الورقة بحيث لم يتبقى منها سوى الأنسجة الليلية مع تكشف جراثيم الفطر السوداء على الأنسجة المصابة، وقد تم عزل الفطر المصاحب للأعراض السابقة على بيئة آجار البطاطس والدكستروز (PDA) عند درجة حرارة الغرفة. وتم فحص الفطر مجهرياً وعرف الفطر على أنه كلارا بارادوكسا *Chalara paradoxa*، قدرت شدة الإصابة بالفطر باستخدام مقياس شدة إصابة يتراوح بين صفر- ٥ درجات وذلك من نتائج اختبارات القدرة الإراضية على سعف فسائل نخيل لبعض الأصناف السالفة الذكر، أظهرت نتائج القدرة الإراضية وجود اختلافات معنوية بين الأصناف المختبرة في مدي قابليتها للإصابة بالفطر *Chalara paradoxa* المسبب لمرض اللحة السوداء في نخيل التمر.

Decline of Date Palm Offshoots

۸۷