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Short Article

Anthracnose Crown Rot of Strawberry Caused by Colletotrichum gloeosporioides in Tripoli, Libya

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Abstract

Anthracnose Crown Rot (ACR) is an economically important disease of strawberries worldwide. During 2019–2020, severe wilting and plant collapse were observed in commercial fields in Tripoli, Libya. Field surveys indicated that ACR caused losses of up to 20% at the seedling stage and 20% after transplanting. Symptomatic plants showed characteristic red and white marbling of crown tissues, progressing to brown rot and rapid wilting. The causal agent was isolated from crowns and morphologically identified as Colletotrichum gloeosporioides species complex, based on hyaline, oblong conidia and salmon-colored acervuli. Pathogenicity tests on strawberry seedlings reproduced crown rot and wilting symptoms, thereby fulfilling Koch's postulates. This study confirmed C. gloeosporioides as the causal agent of ACR in Tripoli, Libya, and highlights the urgent need for local disease management research.

Keywords: Fragaria × ananassa; anthracnose crown rot; Colletotrichum gloeosporioides; strawberry; Libya

Introduction

Strawberry (Fragaria × ananassa Duch.) is increasingly becoming an important horticultural crop in Libya, with protected cultivation expanding to meet local market demand. Anthracnose crown rot (ACR), primarily caused by species within the Colletotrichum gloeosporioides species complex, is recognized as a major constraint to strawberry production in many regions, resulting in plant wilting, crown necrosis, and significant yield losses (Weir *et al.*, 2012; Zhang *et al.*, 2020; Wang *et al.,* 2024). Despite the growing importance of strawberry in Libyan horticulture, there is limited information available regarding the occurrence, etiology, and impact of ACR in Libya.

The aim of this study was to isolate, identify, and confirm the pathogenicity of the causal agent responsible for crown rot and wilting symptoms in strawberry fields in Tripoli, Libya.

Materials and Methods

1. Field survey and sample collection

From 2019 to 2020, surveys were conducted in strawberry fields in Tripoli, Libya. Plants showing typical ACR symptoms - early leaf wilting, stunting, and crown tissues with red and white marbling that later turned brown and necrotic - were recorded and sampled. It was estimated that more than 40% of diseased

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plants in some fields exhibited characteristic ACR symptoms. Crown and root tissues were cut longitudinally to confirm internal discoloration, and symptomatic crown fragments were collected from wilted plants of the cultivar 'Fortuna' (Fig. 1 and 2).

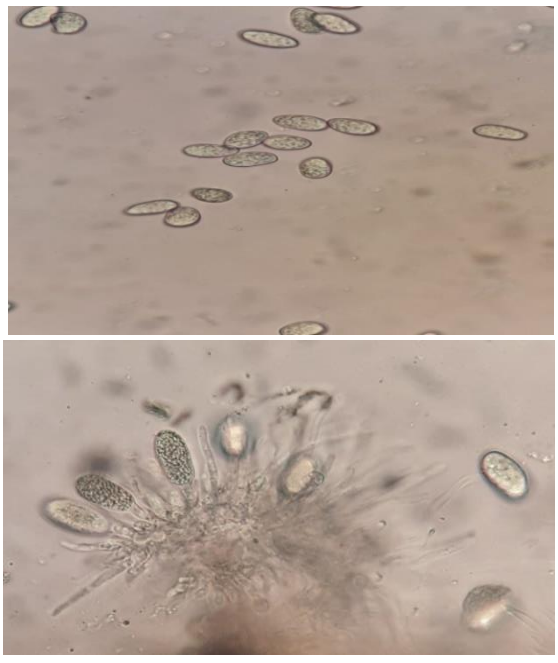
Fig (1). Range of symptoms of ACR showing plants with early leaf wilt symptoms and stunted plants

Fig (2). Lengthwise cut through a crown with anthracnose crown rot showing the shades of red and white marbling

2. Isolation and morphological identification

Symptomatic crown tissues were surface-sterilised in 1% sodium hypochlorite for 2 min, rinsed twice in sterile distilled water, blotted dry on sterile paper, and transferred onto solidified potato dextrose agar (PDA) in Petri plates. Plates were incubated at 27 ± 2 °C for seven days. Emerging fungal colonies were subcultured and purified using the hyphal tip method and maintained on PDA slants for further study.

Colony characteristics, conidial morphology, and acervulus formation were examined under a light microscope. Conidia were described as to shape and color. Morphological features were compared with descriptions of the C. *gloeosporioides* species complex reported by Hyde *et al.* (2009), Weir *et al.* (2012), and Hu *et al.* (2015) (Fig. 3).



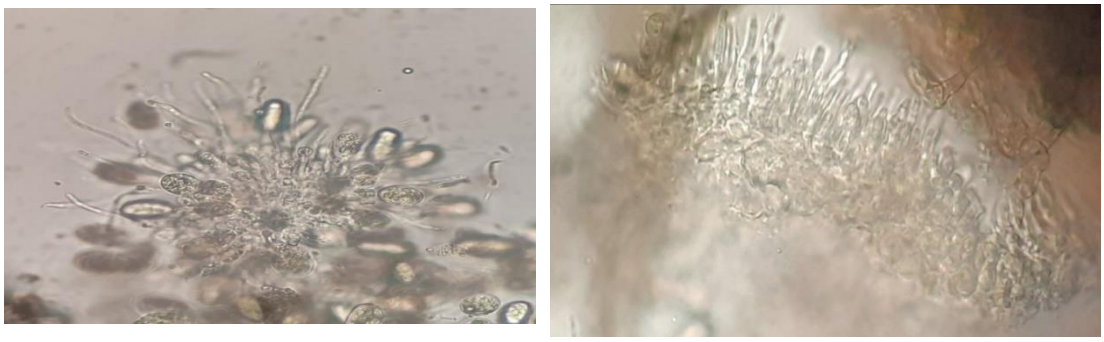


Fig.3. White to salmon colored structures (acervuli) that have millions of spores

3. Pathogenicity test

Pathogenicity of the representative *C. gloeosporioides* isolate was evaluated on strawberry seedlings under greenhouse conditions. Strawberry seedlings were grown in 1 kg plastic bags filled with sterile soil. The soil in each bag was fertilized with wheat at a rate of 5 g per container, and plants were grown in a greenhouse for one month. Four replicates were used, each consisting of ten plants. Three replicates were inoculated with the fungal isolate, while the fourth served as a non-inoculated control. Inoculation was carried out by applying a spore suspension of the isolate to the crown region and surrounding soil. Plants were monitored for symptom development for four weeks after inoculation. Re-isolation of the fungus from symptomatic plants was performed using the same protocol described above, and the recovered isolates were compared morphologically and culturally with the original inoculated isolate.

Results and discussion

1. Disease symptoms and field observations

In surveyed fields in Tripoli, anthracnose crown rot symptoms were consistently associated with plant wilting and collapse. At both seedling and post-transplant stages, ACR was estimated to cause up to 20% plant loss. Longitudinal sections of crowns from affected plants showed characteristic red and white marbling of vascular tissues that progressed to brown rot, accompanied by necrotic roots and a general decline of the entire plant.

These symptoms are typical of anthracnose crown rot of strawberry described for C. *gloeosporioides* and related species in other crops and regions (Hu *et al.,* 2015; Hyde *et al.,* 2009; Weir *et al.*, 2012).

2. Morphological identification

The fungus isolated from symptomatic crowns produced fast-growing colonies on PDA, initially white to greyish, later forming white to salmon-coloured acervuli. Conidia were hyaline, oblong to cylindrical with rounded obtuse ends,

consistent with members of the C. *gloeosporioides* species complex as described by Weir *et al.* (2012) and Hu *et al.*(2015) .

The combination of colony characteristics, conidial morphology, and acervulus formation supported identification of the isolate as Colletotrichum gloeosporioides sensu lato.

3. Pathogenicity and confirmation of Koch's postulates

In greenhouse pathogenicity tests,approximately 70% of inoculated plants developed typical ACR symptoms within one month after inoculation, including wilting, collapse, and internal crown discoloration. No symptoms were observed in control plants.

The fungus re-isolated from inoculated symptomatic plants was morphologically and culturally identical to the original isolate recovered from field samples. These results confirmed C. gloeosporioides as the causal agent of anthracnose crown rot in the tested strawberry plants and fulfilled Koch's postulates.

4. Significance for Libyan Strawberry Production

This study provides evidence that C. *gloeosporioides* is the causal agent of anthracnose crown rot in strawberries in Tripoli, Libya. Given the observed plant losses at both the seedling and post-transplant stages, the disease has a significant potential to reduce strawberry productivity and profitability.

The findings underscore the need for integrated management strategies, including the use of healthy planting material, improved nursery hygiene, and further evaluation of resistant cultivars and fungicidal treatments tailored to local production systems (Zhang *et al.,* 2020; Jia *et al.,* 2022; Hassan & Badr, 2023; Peres & Abney, 2023; Wang *et al.*, 2024).

Conclusion

Field surveys, isolation, morphological characterization, and pathogenicity testing demonstrated that Colletotrichum gloeosporioides is the causal agent of anthracnose crown rot of strawberry in Tripoli, Libya. The disease is associated with substantial plant losses and poses a threat to expanding strawberry production in the country. Future work should focus on detailed epidemiological studies and development of effective management practices to reduce disease impact.

References

Hassan, M. A. and Badr, M. A. 2023. Green Management of Postharvest Anthracnose Caused by Colletotrichum gloeosporioides. Horticulturae, 9(6), 623.

Hu, M. J.; Grabke, A., and Schnabel, G. 2015. Investigation of the Colletotrichum gloeosporioides species complex causing peach anthracnose in South Carolina. Plant Disease, 99(6), 797–805.

Hyde, K. D.; Cai, L.; McKenzie, E. H. C.; Yang, Y. L.; Zhang, J. Z., and Prihastuti, H. 2009. Colletotrichum: A catalogue of confusion. Fungal Diversity, 39, 1–17.

Jia, Z.; Wang, S.; Li, Y.; Wu, M.; Han, C., Li, C. and Luo, J. 2022. Diversity and Resistance to

Thiophanate-Methyl of Colletotrichum spp. in Strawberry Nursery and the Development of Rapid Detection Using LAMP Method. Agronomy, 12(11), 2815.

Peres, N. A. and Abney, M. 2023. New Insights in the Detection and Management of Anthracnose Diseases in Strawberries. Horticulturae, 12(21), 3704.

Wang, B.; Chen, S.; Fu, S.; Hou, W.; Liang, M.; Wang, Y. and Ma, M. 2024. Genomic insights and comparative analysis of Colletotrichum species associated with anthracnose fruit rot and crown rot of strawberry in North Carolina. Frontiers in Microbiology.

Weir, B. S.; Johnston, P. R. and Damm, U. 2012. The Colletotrichum gloeosporioides species complex. Studies in Mycology, 73(1), 115–180.

Zhang, L.; Song, L.; Xu, X.; Zou, X.; Duan, K. and Gao, Q. 2020. Characterization and Fungicide Sensitivity of Colletotrichum Species Causing Strawberry Anthracnose in Eastern China. Plant Disease, 104(6), 1686–1693.

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مقالة قصيرة

تعفن تاج الفراولة الأنثراكنوزي المتسبب عن فطر *Colletotrichum gloeosporioides* في طرابلس، ليبيا.

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المستخلص

يُعد تعفن تاج الفراولة الأنثراكنوزي (ACR) مرضًا اقتصاديًا هامًا على مستوى العالم. خلال الفترة 2019–2020، لوحظ ذبول وانهيار شديد للنباتات في الحقول التجارية في طرابلس، ليبيا. أظهرت المسوحات الميدانية أن ACR تسببت في خسائر تصل إلى 20% في مرحلة الشتلات و20% بعد الزرع. أظهرت النباتات المصابة تلوّنًا رخاميا أحمر وأبيض مميزًا لأنسجة التاج، ما تطوّر إلى تعفن بني وذبول سريع. تم عزل العامل المسبب من التيجان وتم تحديده مورفولوجيًا على أنه الفطر *Colletotrichum gloeosporioides*، بناء على الأبواغ الشفافة المستطيلة والتراكيب السلمونية. أظهرت اختبارات الإمراضية على شتلات الفراولة تكاثر أعراض تعفن التاج والذبول، مما يحقق فرضيات كوخ. أكدت هذه الدراسة أن *C. gloeosporioides* هو العامل المسبب لـ ACR في طرابلس، ليبيا، مما يسلّط الضوء على الحاجة الملحة لإجراء أبحاث محلية لإدارة المرض.

الكلمات المفتاحية: Fragaria × ananassa؛ تعفن تاج الفراولة الأنثراكنوزي؛ *Colletotrichum gloeosporioides*؛ الفراولة؛ ليبيا

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