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Powdery Mildews in the Libyan Jamahiriya

I. Identity of Certain Powdery Mildew Fungi

M. WAJID KHAN[1] AND AHMED E. A. MUSSA[1]

ABSTRACT

An attempt has been made to enlist and identify the powdery mildews infecting cultivated and wild plants in Libyan Jamahiriya. This paper is the first in the series and includes *Erysiphe heraclei*, *Erysiphe sordida*, *Erysiphe ciohoracearum*, and *Erysiphe graminis*. All the four species exhibited perithecial production in nature on their respective hosts. *E. cichoracearum* was found on *Amerboa lippii* and this host is an addition to the host index of the species. The occurrence of *E.graminis* on *Bromus diandrus* is also a new record.

INTRODUCTION

The powdery mildews usually do not cause spectacular losses to the crops but their recurrence annually is responsible for reduction in quality and quantity of the produce in a damaging way and is a matter of consequence for the economy of the crops. Many powdery mildew species have overlapping host range which includes wild as well as cultivated plangs. Many weeds are collateral host of a number of Erysiphaceae that are responsible for the powdery mildew of different crops of economic importance. Such weeds serve as source of primary inoculum.

Pucci (9, 10) listed the causal organisms of different diseases affecting certain field crops, vegetables, fruit trees and ornamentals in Jamahiriya. The list included also the powdery mildew fungi like *Oidium* sp., *Leveillula taurica*, *Sphaerotheca pannosa*, *Podosphaera oxycanthae*, *Erysiphe graminis* and *Erysiphe polygoni* on some plants of economic importance. In most cases only conidial stage was observed and powdery mildew fungi were assigned to *Oidium* spp. In the absence of perfect stage the proper identity of the most powdery mildew fungi was not ascertained. Mohamed (8) during plant disease survey of barley and wheat recognised. *Erysiphe graminis* causing important disease of barley in Jamahiriya.

Powdery mildew flora of Libyan Jamahiriya apparently has not been enlisted exclusively although such informations are of immense value in any kind of study related to powdery mildews. With this aim in view, this study was conducted to enlist and identify the powdery mildew fungi infecting different plants in Jamahiriya. The present paper forms the first in the series.

[1] *Department of Plant Protection, Faculty of Agriculture, University of Alfateh, Tripoli, S.P.LA.J.*

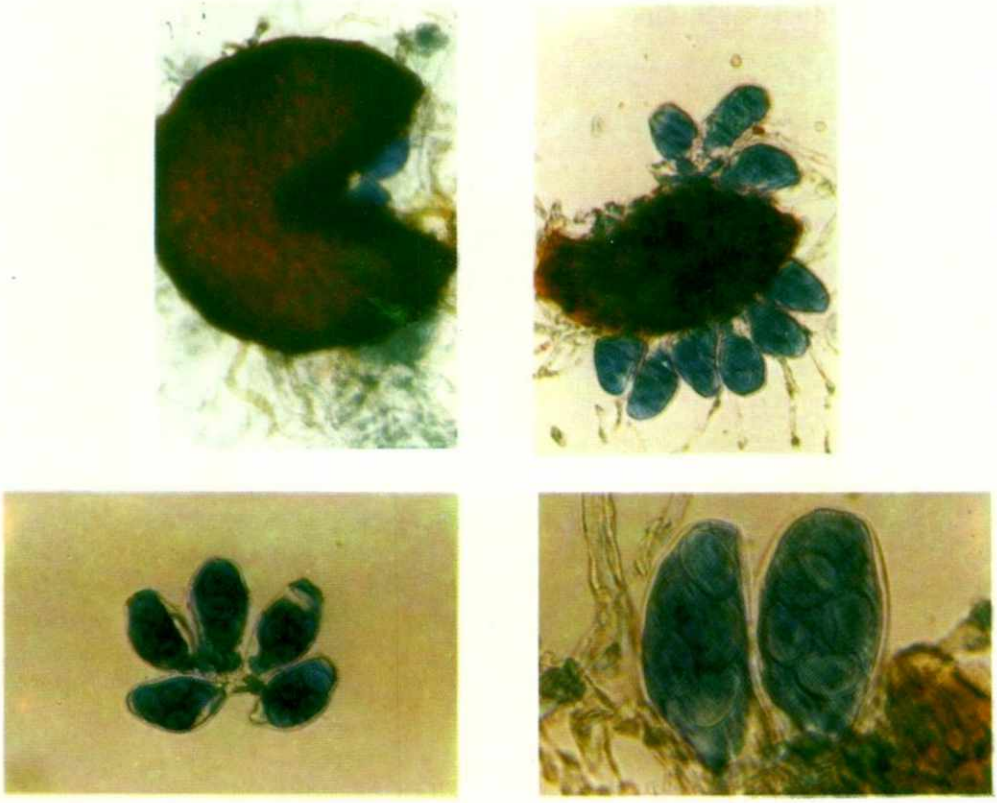

Fig. 1. *Erysiphe heraclei* from *Torilis nodosa*. A. Perithecium with appendages and asci; B. Fully ruptured perithecium with several asci; C. A group of asci with 3–4 ascospores; D. Two asci with 5 ascospores in each.

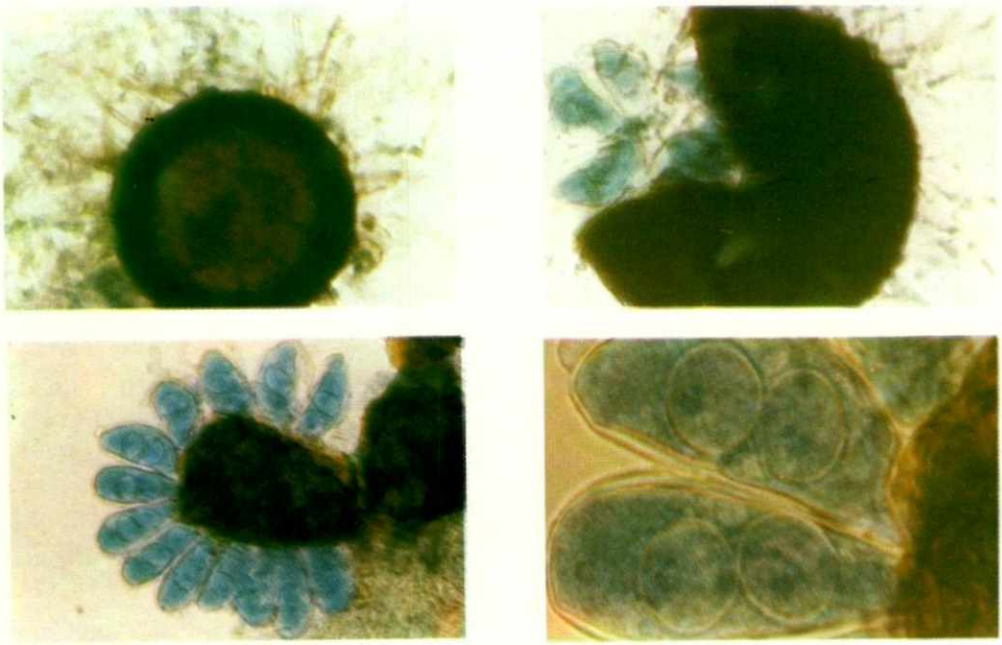

Fig. 2. *Erysiphe cichoracearum* from *Amerboa lippii*. A. Perithecium with mycelioid appendages; B. A ruptured perithecium with asci; C. Fully ruptured perithecium with several asci each with 2 ascospores; D. Two asci with 2 ascospores in each.

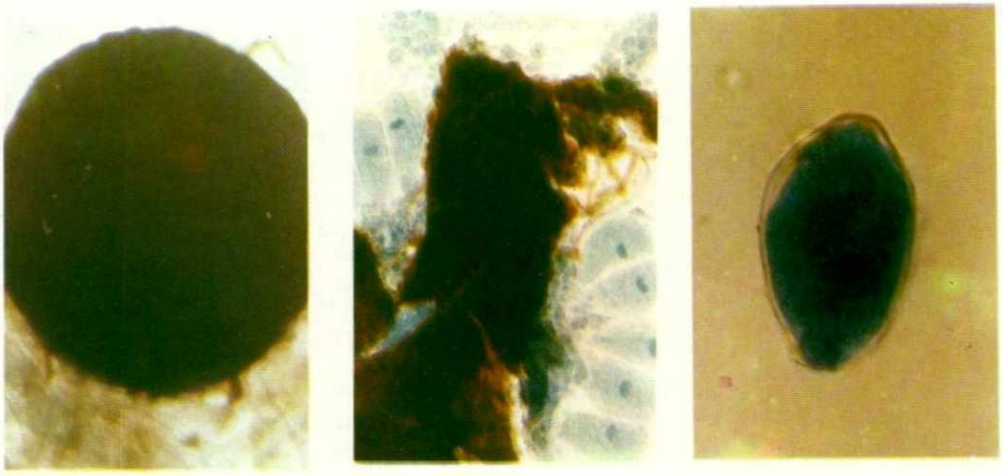

Fig. 3. *Erysiphe graminis* from *Bromus diandrus*. A. A perithecium with rudementary appendages and hyaline bristles; B. A ruptured perithecium with several asci without ascosores: C. A. single ascus without ascospores.

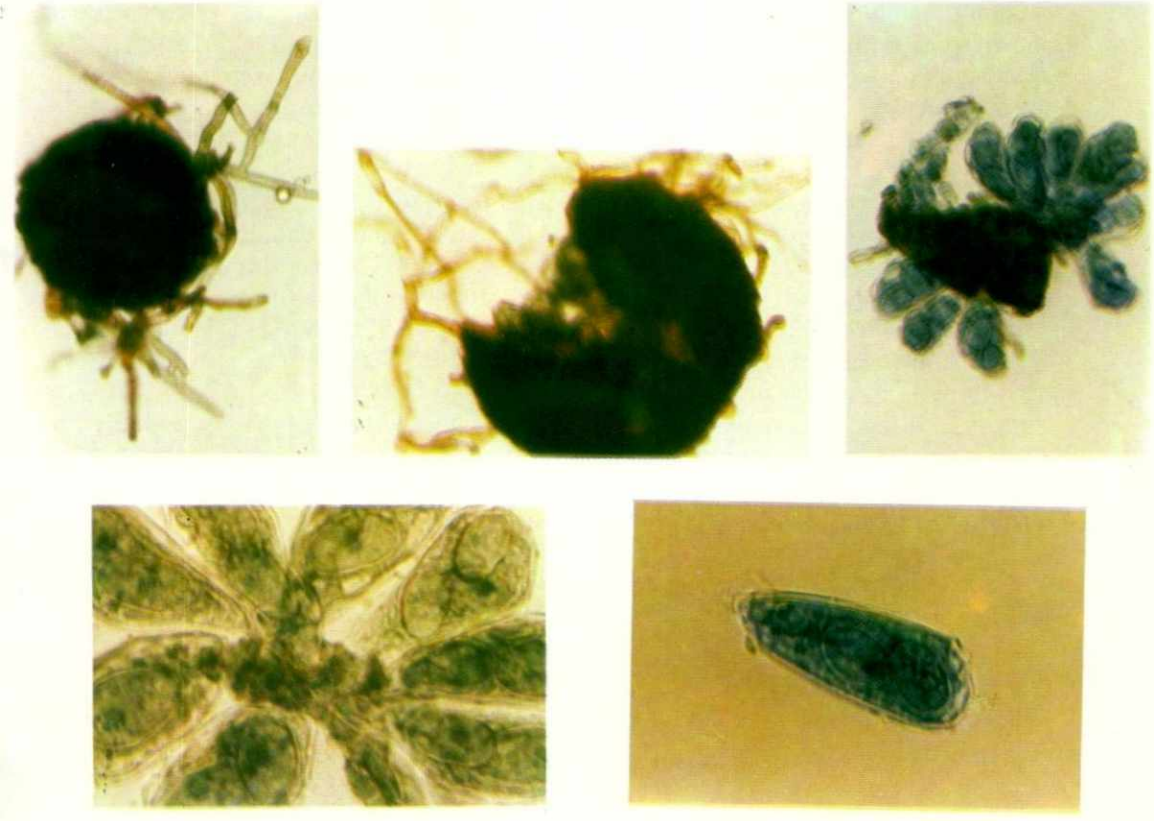

Fig. 4. *Erysiphe sordida* from *Plantago lagopus*. A. A complete perithecium with appendages; B. A slightly ruptured perithecium with mycelioid appendages; C. A fully ruptured perithecium with several asci each with 2 ascospores; D. A group of asci with 2 ascospores, one ascus containing 3 ascospores; E. A single ascus with 2 ascospores.

MATERIALS AND METHODS

Different weeds and cultivated plants were regularly observed in fields and gardens, to begin with in Tripoli, for powdery mildew infections. Infected plant materials were collected. Herbarium for each was prepared and some were preserved for detailed study. The severity of the infection was also observed. The morphological characteristics of each powdery mildew species were microscopically studied. Dimensions of different structures present were measured. In the present study, the identifications are based on perithecial characters (1, 3, 4).

RESULTS AND DISCUSSION

Some of the powdery mildew species recorded in this study in their perithecial stage are enumerated below. The morphological features of each species are described. The importance of each species as parasites of crop plants whereever considered necessary are discussed and emphasized.

1. Erysiphe heraclei DC. ex St-Am.

On the living leaves and stems of *Torilis nodosa* (L.) Gaertner (Umbelliferae), collected from roadsides near Faculty of Vetrinary, Alfateh University Campus, Tripoli, S.P.L.A.J. on 19th March, 1978.

Severe infections present on stems, leaves, inflorescences and floral parts. Mycelium well developed, much branched, amphiphyllous. Conidia usually single rarely in short chain, cylindrical, $34–37 \times 9-15\mu$ ($35 \times 12\mu$). Perithecia profusely developed, dense to gregarious, amphiphyllous and all around stem; even on floral parts. Perithecia globose, some with slight depression, black to brown 92–168 μ (126 μ) in diam. Appendages numerous, mycelioid, basally inserted, hyaline to brown, 1–2 times as long as the diameter of the ascocarp, irregularly branched. Asci 4–11 obovate to subglobose, $45–67 \times 22-41$ μ (58×30 μ). Ascospores 3–5, usually 4, ovate to elliptical $34–37 \times 9–15$ μ (35×12 μ). (Fig. 1 A, B, C, D.).

Morphological characters fully resembled with those of C.M.I. description of the species from *Daucus carota* (Umbelliferae) (3). However, certain variations with regard to the number of asci in each perithecium; measurements of perithecia, asci and ascospores were observed. Perithecia measured 92–168 μ in diam. as against 85–102 μ in diam.; asci $45–67 \times 22–41$ μ as against $55–70 \times 30-45$ μ; and ascospores $34–37 \times 19-15$ μ as against $20–28 \times 10-15$ μ. The number of asci in each perithecium ranged from 4–11 as against 3–8.

E. heraclei is reported on about 85 genera of the Umbelliferae (2). It causes powdery mildew of carrot, fennel, parsley and many other Umbelliferous crops of economic importance. It is reported from Morocco, Sudan, Tanzania and Egypt in Africa; Afghanistan, Burma, India, Iran, Palestine, Japan, Turkey, U.S.S.R. and Pakistan in Asia and is widely distributed in Europe, South America and U.S.A. (2).

E. heraclei has been recorded on seven species of *Torilis* including *T.nodosa*. This, however, has not been recorded and described from Libyan Jamahiriya.

2. Erysiphe cichoracearum DC.

On the living plants of *Amerboa lippii* L. (Compositae), collected from Alfateh University Campus, Tripoli, S.P.L.A.J., 3rd April 1978.

Severe infection present on stems, leaves and branches. Mycelium well developed, evanscent, amphiphyllous. Conidia in long chains, ellipsoid or barrel shaped, variable in size, 25–45 × 12 – 25 μ. Perithecia profusely developed, amphiphyllous more on the lower surface; all around stem and branches, scattered to densely gregarious, globose, brown to black, 107–18 μ (135μ) in diam. Appendages numerous, basally inserted, mycelioid, interwoven with mycelium, hyaline to dark brown, long, rarely branched. Asci 8–21, ovate to broadly ovate, rarely sub-globose, more or less stalked, 52–74 × 22–41 μ (60 × 29μ). Ascospores usually 2 sometimes 3, 13–24 × 11–17 μ (19 × 13μ). (Fig. 2A, B, C, D.).

Morphological characters were identical to those described for *E.cichoracearum* from *Lactuca integrata* (C.M.I. description No. 152), but certain variations were noticed. The diameter of perithecia varied from 107–184 μ as against 90–135 μ; the number of asci per perithecium ranged from 8–21 as against 10–25; asci measured 52–74 × 22–41 μ against 60–90 × 25 – 50 μ; and ascospores measured 13–24 × 11 – 17 μ as against 20–30 × 12–18 μ described for the species.

E. cichoracearum is worldwide in distribution and is reported to occur on more than 230 species belonging to some 50 genera. It is chiefly parasitic on Compositae. It also causes powdery mildew of cucurbits in several countries causing considerable losses to the crops (5, 6). It is potentially one of the most important species of *Erysiphe* that affect the crop plants and causes powdery mildew of many other economically important crops like lettuce, safflower etc. It also infects *Vinca* (Apocynaceae), *Abelmoschus* (Malvaceae), *Antirrhinum, Digitalis* (Scrophulariaceae), *Fraxinus excelsior* (Oleaceae) (1).

The host list provided by Blumer (1) does not include *Amerboa lippii.* This report forms the first record of *E.cichoracearum* on *Amerboa lippii* and the genus and species are an addition to the host index of *E.cichoracearum.*

There has been no record of *E.cichoracearum* on this host from Jamahiriya.

3. Erysiphe graminis DC.

On the living leaves of *Bromus diandrus* Roth. (Graminae) collected from Agriculture Farm, Alfateh University, Tripoli, S.P.L.A.J. 4th April, 1978.

Moderate to severe infection on leaves. Primary mycelium formed scattered to elongate or ellipsoidal patches, at first white turning to pale brown to grey. Conidiophores arising from the primary mecelium short with terminal generative and swollen basal cell. Conidia in long chain, ellipsoidal 26–37 × 9–15 μ (29 × 12 μ). Secondary mecelium persistent, interlaced, bearing numerous thick walled, rigid bristles forming a thick felt. Perithecia embedded in the felt, globose, dark brown to black 168–276 μ (220μ) in diam. Appendages poorly developed, rudimentary, very short, dark brown in colour. Asci 8–25, ovate to cylindrical, more or less stalked, 63–100 × 26 – 41 μ (80 × 31 μ). Ascospores — absent. (Fig. 3A, B, C.).

Morphological characters were identical to those of C.M.I. descriptions (No. 153) from *Hordeum vulgare.* There were only minor variations in the dimensions of certain structures.

E.graminis is recorded on numerous species belonging to over 100 genera of Graminae. This species is recorded on 14 species of *Bromus* as listed by Blumer (1). But *B.diandrus* does figure in this list. This record of *E.graminis on Bromus diandrus* is apparently new and this host is new addition to the host index of *E.graminis.*

On living leaves of *Hordeum vulgare* L. (Graminae) collected from the Agriculture Farm, Alfateh University, Tripoli, S.P.L.A.J., 9th April 1978 and 20th March, 1979.

The infection was severe on the plants. Almost the entire upper leaf surface was covered with persistent mycelial felt. Profuse development of perithecia embedded in tufted persistent mycelium was observed. Less infection and perithecial development were noticed on the lower surface.

Morphological characters were identical to those described by Kapoor (4) in C.M.I. descriptions of the species. Ascospores were, however, absent.

E.graminis causing powdery mildew of wheat, barley, oats and other cereals any many grasses is worldwide in distribution. Reduction in the yield of barley has been estimated upto nearly 28% when powdery mildew develops prior to heading (4). This species is comprised of distinct biological forms. Marchal (7) distinguished seven biological forms on the basis of the specificity of host genera.

E.graminis seems to recurr every year in Jamahiriya. Due to its potentiality as a major pathogen of cereals particularly barley, suitable control measures should be adopted for its control.

4. Erysiphe sordida Junell.

On the living plants of *Plantago lagopus* L. (Plantaginaceae) collected from the fields near the Faculty of Pharmacy, and Agriculture Farm, Alfateh University, Tripoli, S.P.L.A.J., 26th March, 1978 and 20th March, 1979.

Severe infection on leaves and petioles. Mycelium well developed specially on the upper surface, amphiphyllous, conidia in chain, ellipsoidal to cylindrical, 30–$40 \times 15-20$ μ. Perithecia profusely developed, amphiphyllous, also on petioles, scattered to dorsoverntrally depressed, dark brown to black, 107–168 μ (137 μ) in diam. Appendages many, compactly arranged, broadly inserted, mycelioid, brown to dark brown, much longer than the diameter of perithecia. Asci 5–17, oblong to obclavate, slightly stalked, $45–67 \times 19–33$ μ(57×25 μ). Ascospores 2, sometimes 3, ellipsoidal to avoid, $17–26 \times 11-15$ μ (21×13 μ). (Fig. 4A, B, C, D, E.).

The morphological characters of the species fully resembled with those described by Blumer (1) except for the size of perithecia and number of asci. They ranged from 107–168 μ in contrast to 90–120 μ in Blumer's description. The number of asci varied from 5–17 as against 5–20 recorded for the species.

E.sordida is reported to occur on *P.lagopus* (1). In Jamahiriya, the species seems to appear regularly in severe form causing eventual death of the plants.

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البياض الدقيقي في الجماهيرية الليبية

١ — التعرف على بعض فطريات البياض الدقيقي

د. محمد واجد خان د. أحمد الطيب ابو موسي

المستخلص

أجريت محاولة لدراسة ومعرفة البياض الدقيقي الذى يصيب النباتات البرية والنباتات المزروعة في الجماهيرية الليبية . وهذه تعتبر أول حلقة يتبعها حلقات أخرى للكشف عن هذا المرض ومعرفة مدى اصابتة لمختلف انواع النباتات وكذلك معرفة انواع مرض البياض الدقيقي .

هذا البحث يحتوى على أربعة أنواع مختلفة من مرض البياض الدقيقي الذى اكتشف لأول مرة وهو يصيب تلك العوائل وقد اكتشف أن هذه الأربعة تكون أجسامًا ثمرية على هذه العوائل .