Powdery Mildews in the Libyan Jamahiriya
IV. Identity of certain powdery mildew fungi

M. WAJID KHAN[1]

ABSTRACT

This paper is fourth in the series based on studies made to enlist and identify powdery mildew species infecting cultivated and wild plants in the Libyan Jamahiriya. It includes *Sphaerotheca erodii*, *Sphaerotheca fuliginea*, *Sphaerotheca pannosa*, *Erysiphe betae*, *Erysiphe galeopsidis*, *Erysiphe graminis*, *Erysiphe polygoni*, *Erysiphe heraclei*, *Erysiphe convolvuli* and *Podosphaera oxyacanthae* var. *tridactyla* on certain hosts not described in this series. *S. erodii*, *E. betae* and *E. galeopsidis* are new to the powdery mildew flora of the Libyan Jamahiriya. *S. erodii* was recorded on *Erodium malacoides* and *Erodium laciniatum*; *E. betae* on *Beta vulgaris* var. *cicla*; and *E. galeopsidis* on *Lamium amplexicaule*. The occurrence of *E. graminis* on *Avena barbata*, *Avena eriantha* and *Lophochloa cristata* and *S. fuliginea* on *Bidens bipinnata* are new world records. The records of *E. graminis* on *Poa pratensis*, *E. polygoni* on *Polygonum equisetiforme*, *E. heraclei* on *Foeniculum vulgare* and *E. convolvuli* on *Ipomea hederacea* are new to this country.

INTRODUCTION

Records of powdery mildew fungi in the Libyan Jamahiriya are scanty and fragmentary. Causal organisms of powdery mildews from various plants have not been identified. The identity of many powdery mildew species reported to occur on several hosts is not well established. Khan and Mussa (11), Khan (8) and Khan and Faraj (10) recently made an attempt to verify and establish the identity of several powdery mildew species occuring on different hosts in the Jamahiriya. The present paper, fourth in the series, enlists the identity of certain powdery mildews on some hosts not included so far in this series.

MATERIALS AND METHODS

Different wild and cultivated plants were observed for powdery mildew infection in different localities. Infected plants were collected and brought to the laboratory. Disease severity was scaled on visual basis as mild, moderate and severe. Infected plant

[1] *Department of Plant Protection, Faculty of Agriculture, University of Al-Fateh, Tripoli, S.P.L.A.J.*

parts were thoroughly examined for the presence or absence of perithecia. The morphological characteristics of the fungus were microscopically studied. Dimensions of structures were measured wherever considered necessary. In some cases, conidia were germinated to study their mode of germination and germ tube formation. Conidia, in few cases were also examined for the presence or absence of fibrosin bodies (5).

In absence of perithecia, conidial characters and records on the hosts based on perithecial and/or conidial stage from other parts of the world were accounted for identification. The host index provided by Blumer (2) was largely used as check list.

RESULTS AND DISCUSSION

Certain powdery mildew species on some hosts collected from different localities in the Libyan Jamahiriya and not included in the earlier papers of this series are given below. Some host records are new for the Jamahiriya. The identity of certain species reported from this country is re-ascertained. A few records are addition to the known host index of the powdery mildew species. Points of significance, if any, have been discussed with each species.

1. *Sphaerotheca erodii* (**Jacz**) **Rayss.**

On living plants of *Erodium malacoides* (L.) L. Herit. (Geraniaceae) collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli (S.P.L.A.J.) 10th April, 1979.

Mild to moderate infection on leaves. Mycelium well developed, mostly epiphyllous, hyaline. Conidia in chain $16-25 \times 11-15\,\mu$. Perithecia absent.

On living plants of *Erodium laciniatum* (Cav.) Willd. (Geraniaceae) collected from Gharabuli (S.P.L.A.J.), 8th April, 1979.

Moderate infection, mostly on upper surface of the leaves. Mycelium well developed, hyaline. Conidia in chain, $17–25 \times 12-15\,\mu$. Perithecia absent.

S. erodii is listed to infect seven species of *Erodium* including *E. malacoides* and *E. laciniatum* (2). So far, there is no record of *S. erodii* in Libya on any host and it is thus an addition to the powdery mildew flora of the country. Three species of *Sphaerotheca* viz. *S. fuliginea*, *S. euphorbiae*, *S. pannosa* and *S. pannosa* var. *persicae* are known to exist in this country (1, 8, 9, 10). *S. erodii* is thus an addition to the list of species of *Sphaerotheca* occurring in this country. This species, however, is not economically important.

2. *Erysiphe galeopsidis* **DC ex Merat.**

On living plants of *Lamium amplexicaule* L. (Labiatae) collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli (S.P.L.A.J.), 4th April, 1978 and from Swani Ben-Adam (S.P.L.A.J.), 12th May, 1979.

Moderate to severe infection on both surfaces of leaves, also on stems, conidia in chain, $25-40 \times 15-20\,\mu$ ($27 \times 14\,\mu$). Perithecia on stem, sparsely developed, scattered; globose, dark brown to light brown in colour, $105-145\,\mu$ ($130\,\mu$) in diam. Appendages mycelioid, hyaline to brown, as long as the diameter of the perithecia or shorter, basally inserted. Asci 5–12, fusiform, stalked, $40-60 \times 18-26\,\mu$ ($51 \times 24\,\mu$). Ascospores

2 – 5, ellipsoidal to globular, one bigger than the others, mostly not well formed in all asci, some irregular in shape with wavy margins.

E. galeopsidis is reported to infect nine species of *Lamium* including *L. amplexicaule* (2). This species is, however, new to the powdery mildew flora of the Libyan Jamahiriya.

3. *Erysiphe betae* **(Vanha) Weltzien.**

On living plants of *Beta vulgaris L.* var. *cicla* L. (Chenopodiaceae) collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli, (S.P.L.A.J.), 20th June, 1979.

Mild to moderate infection on leaves, amphiphyllous. Conidial stage present; similar to those of *E. betae* (6). Perithecia absent.

This species chiefly causes powdery mildew of sugarbeet and is distributed in some countries of Africa and Asia and is widely distributed in Europe (6). Although Hirata (4) enlisted Libya as a country where *E. betae* is known to occur in Africa (6) but the species on sugarbeet in Libya was known as *E. communis* (1). *E. betae* was previously known in the literature as *E. communis* or *E. polygoni* but it is now recognised as *E. betae* because it is morphologically distinct from them (6). The powdery mildew on sugarbeet in Libya, therefore, should be recognised as *E. betae* in accordance with the current taxonomic status. *E. betae* has a restricted host range (3). It causes considerable economic loss (3, 6). The occurrence of *E. betae* on *B. vulgaris* var. *cicla*, the Swiss chard, is a first record for the Jamahiriya.

4. *Erysiphe graminis* **DC.**

On living plants of *Avena barbata* Pott. Link. (Poaceae = Graminae) collected from Al-Baida (S.P.L.A.J.), 25th March, 1980.

Mild to severe infection. Only conidial stage present. Morphological characters similar to those of *E. graminis.*

On living plants of *Avena eriantha* Durieu (Poaceae = Graminae) collected from Al-Baida, (S.P.L.A.J.), 25th March, 1980.

Mild to severe infection. Conidial stage present; similar to those of *E. graminis.* Perithecia absent.

On living plants of *Lophochloa cristata* (L.) Hyl. (Poaceae = Graminae) collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli, (S.P.L.A.J.), 12th March, 1980.

Severe infection on leaves and sheaths, amphiphyllous. Conidial and perithecial stages present. Perithecia gregarious to sparse. Morphological characters were identical to those of *E. graminis.* Ascospores absent.

On living plants of *Poa pratensis* L. (Poaceae = Graminae) collected from the lawns of the Faculty of Agriculture, Al-Fateh University, Tripoli, (S.P.L.A.J.), 24th April, 1980. Moderate to severe infection on leaves. Only conidia similar to those of *E. graminis* were present.

E. graminis is reported to infect 12 species of *Avena* but this does not include *A. barbata* and *A. eriantha* (2). These are new world records. *P. pratensis* is reported to be infected by *E. graminis* besides other eleven species of *Poa* (2). The occurrence of *E. graminis* on *Lophochloa cristata* is also a new record as it is not recorded on *Lophochloa* species (2).

The records of *E. graminis* on all these four grasses are new for the Jamahiriya. *E. graminis* is known to exist in this country on wheat, barley, oats and grasses such as *Bromus diandrus* and *Phalaris minor* (8, 11, 13, 15).

5. *Erysiphe convolvuli* **DC.**

On living plants of *Ipomea hederacea* (L.) Jacq. (Convolvulaceae) collected from the Al-Fateh University campus, Tripoli, (S.P.L.A.J.), 16th March, 1980.

E. convolvuli was reported for the first time by Khan (8) to infect *Convolvulus arvensis* in the Jamahiriya. *I. hederaceae* is an additional host for this species in the Jamahiriya.

6. *Erysiphe heraclei* **DC. ex St. Am.**

On living plants of *Foeniculum vulgare* Mill. (Umbelliferae) collected from Jabal-Alkhdar Agriculture Project Area, (S.P.L.A.J.), 30th May, 1981.

Mild to severe infection on leaves and stem. Both conidial and perithecial stages present. Morphological characters identical to those of *E. heraclei* (7, 11).

The existence of this species in the Jamahiriya was reported by Khan & Mussa (11) in perithecial stage on *Torilis nodosa*, a wild umbelliferous plant. *F. vulgare* is now an additional host for this species in this country. *E. heraclei* also referred to as *E. umbelliferum* (7) causes powdery mildew on plants of economic importance in the family umbelliferae.

7. *Erysiphe polygoni* **DC ex Merat.**

On living plants of *Polygonum equisetiforme* Sibth. & Sm (Polygonaceae) collected from Jabal-Akhdar Agriculture Project Area, (S.P.L.A.J.), 5th May, 1981.

Mild to severe infection on leaves. Conidial stage present. Perithecia absent.

Previously powdery mildews on peas, eggplant, cabbage and carrot in Libya were referred to as *E. polygoni* (1, 14). Pucci (15) doubtfully assigned an *Oidium* stage from *Phaseolus vulgaris* to *E. polygoni*. These records, however, need re-confirmation because powdery mildews on these hosts are not recognised as *E. polygoni*. Khan (8) claimed powdery mildew of peas and lentil in the Jamahiriya as *E. pisi*. According to the present taxonomic status, powdery mildews of eggplant, cabbage, carrot and *Phaseolus vulgaris* are not recognised as *E. polygoni*. *E. polygoni* is considered chiefly parasitic on the members of polygonaceae. The present record of *E. polygoni* on *P. equisetiforme* is new to the Jamahiriya.

8. *Sphaerotheca pannosa* **(Wall. ex Fr.) Lev.**

On living plants of *Rosa* sp. (Rosaceae) collected from the Agriculture Farm Gardens, Faculty of Agriculture, Al-Fateh University, Tripoli (S.P.L.A.J.), 4th June, 1978.

Mild to moderate infection present on the upper surface of the leaves. Only conidial stage present.

S. pannosa is well known to cause powdery mildew of roses in most temperate and sub-tropical countries. *S. pannosa* is recorded to infect roses in Libya. *S. pannosa* var. *persicae* was also reported from almond, peach and plum in Libya (1).

9. *Sphaerotheca fuliginea* **(Schlecht.) Poll.**

On living plants of *Bidens bipinnata* L. (Compositae), collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli, (S.P.L.A.J.), 24th April, 1980.

Mild to severe infection present on leaves. Only conidial stage present; identical to *S. fuliginea.*

S. fuliginea is reported to exist in the Libyan Jamahiriya on a number of cucurbits and non-cucurbitaceous plants (9, 10). This record of *S. fuliginea* on *Bidens bipinnata* is new to the Jamahiriya.

10. *Podosphaera oxyacanthae* **var.** *tridactyla* **(Wall.) Salmon.**

On living plants of *Armeniaca vulgaris* Lam. *Prunus armeniaca* L. (Rosaceae), collected from the Agriculture Farm, Faculty of Agriculture, Al-Fateh University, Tripoli, (S.P.L.A.J.), 2nd July, 1979.

Mild to moderate infections on leaves. Conidial stage present; identical to those of *P. oxyacanthae* var. *tridactyla.*

The occurrence of *Oidium* on apricot (*P. armeniaca*) was reported in this country (1, 15). Kranz (12) observed *P. oxyacanthae* var. *tridactyla* on *Prunus* spp. at Derna and Gubba.

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البياض الدقيقي في الجماهيرية العربية الليبية الشعبية الإشتراكيـــة
٤ — التعرف على بعض فطريات البياض الدقيقـــي

د. محمد واجد خـــان

المستخلـــص

هذا هو البحث الرابع ضمن سلسلة الدراسات الخاصة بكشف وتعريف أنواع البياض الدقيقي التي تصيب النباتات الحقلية والبرية في الجماهيرية وهي تحوي عشرة أنواع لمختلف أجناس فطريات البياض الدقيقي على عوائل مختلفة .

وقد دلت النتائج أن ثلاثة أنواع منها تعتبر اكتشاف جديد في ليبيا كما أن ظهور بعض الأنواع على عود من العوائل يعتبر اكتشاف جديد في ليبيا وفي العالم .