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PODOSPORA PSEUDOINQUINATA SP. NOV.

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During the investigation on coprophilous fungi, a species of *Podospora* was collected on camel dung from Paradise Point, Karachi. Since this species does not fit with any of the known species, a new species *Podospora pseudoinquinata* is proposed.

Key words: *Podospora*, New species.

Introduction

Genus *Podospora* belongs to the family Sordariaceae [1-3]. Most of the species belonging to this genus are coprophilic with comparatively large perithecia found on the dung of grazing animals like cow, horse, sheep, deer, mouse and rabbit etc. The ascospores of *Podospora* possess an apical germ pore, a basal primary appendage and gelatinous secondary appendages.

During the investigation on coprophilous fungi, an interesting *Podospora* species was collected on camel dung from Paradise Point, Karachi. Microscopic examinations revealed that this species is sufficiently different from all the described species of *Podospora*, and therefore, justify its treatment as a new species. The material studies has been preserved in the Mycological Herbarium of PCSIR Laboratories Complex, Karachi.

Materials and Methods

The fungus was isolated from the dung as described in an earlier paper by Ahmed and Asad [4]. Ascospore measurements were taken in water. The length of asci included the stipe and spore bearing portion. The stipe was measured separately. The width of the asci and ascospores as well primary and secondary appendages was taken at the broadest parts.

The hyaline appendages which were difficult to see in water mounts were stained in cotton blue and Indian ink. It was not possible to study the germ pore in top view, and therefore, the measurements of the side view were taken.

Podospora pseudoinquinata Ahmed and Ahmedunisa sp. nov. Peritheciis superficialibus vel semi-immersis, sparsis vel aggregatis, sub-globosis, nigris, collo perithecii brevi, 400-650 x 400-600 μ m; pilis longis, flexuosis, septatis, 400-600 x 2.5-3.0 μ m peridio perithecii tenui membranaceo. Ascis octosporis, clavatis, 190-250 x 45-55 μ m, suprene contractis et late rotundatis, inferne attenuatis in stipitem longum, annulo absentibus; paraphysibus copiosis, filiformibus, septatis, superantibus. Ascosporis biserialis, ellipsoideis, 40-55 (-60) x

30-40 (-45) μ m, initio hyalinis, olivaceis dein atro-brunneis et opacis, germinali apicali, rotundatis, 2.5-3.5 μ m late; primaria appendice cylindracea, hyalina, 26-38 x 12-16 μ m ad basem ascosporae alligata; secundaria et superiore appendice ad apicem ascosporae excentrice alligata, simili flagello, basi lata 4.5-5.0 μ m; secundaria et inferiore similibus (Figs. 1-3).

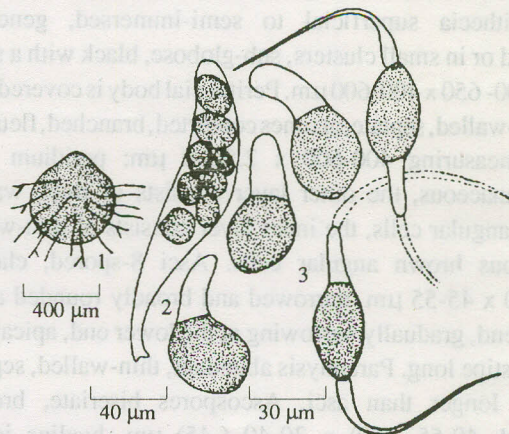


Fig. 1. (i). Perithecium; with hairs; (ii) Ascus with 8 ascospores; (iii) Ascospores with primary and secondary appendages.

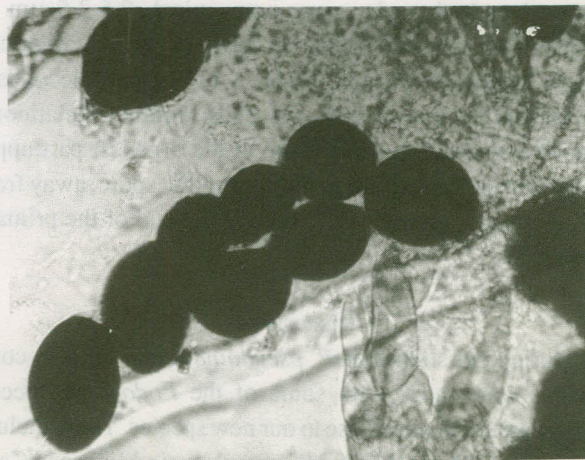


Fig. 2. Photomicrograph showing the arrangement of ascospores within the ascus.

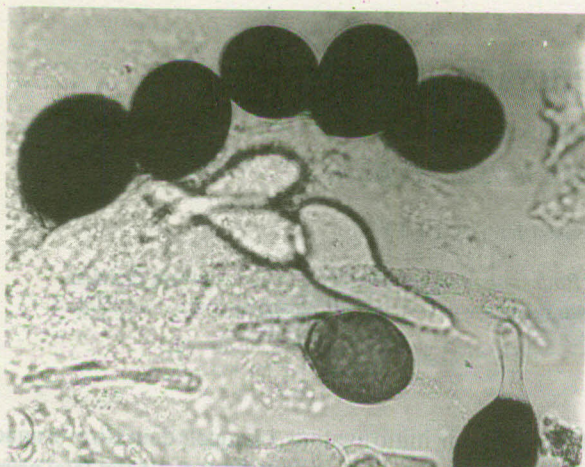


Fig. 3. Photomicrograph showing the shape of ascospores with remnants of appendages.

Holotype: in fimo camelus, Mycological Herbarium of PCSIR Laboratories Complex, Karachi (No.437).

Perithecia superficial to semi-immersed, generally scattered or in small clusters, sub-globose, black with a small neck, 400-650 x 400-600 μm . Perithecial body is covered with smooth-walled, septate, at times contorted, branched, flexuous hairs, measuring 400-600 x 2.5-3.0 μm ; peridium thin, membranaceous, the outer layer consists of thick walled, brown, angular cells, the inner layer consists of thin-walled olivaceous brown angular cells. Asci 8-spored, clavate, 190-250 x 45-55 μm , narrowed and broadly rounded at the upper end, gradually narrowing at the lower end, apical ring absent, stipe long. Paraphysis abundant, thin-walled, septate, fragile, longer than asci. Ascospores biserial, broadly ellipsoid, 40-55 (-60) x 30-40 (-45) μm , hyaline in the beginning becoming olivaceous brown and finally dark brown and opaque at maturity, broadest in the middle, narrowed at both ends, germ pore apical, 2.5-3.5 μm in diameter. Primary appendage at the lower end, cylindrical, straight to slightly curved, 26-38 x 12-16 μm . Secondary appendages present at both the ends, hyaline, gelatinous, whip-like, measuring 4.5-5.0 μm at the broadest part; upper one eccentrically attached to the apex of the spore, away from the germ pore, lower one attached at the end of the primary appendage.

Discussion

During our studies on *P. pseudoinquinata* sp. nov. comparisons were made with some of the *Podospora* species which were somewhat close to our new species. These include *P. communis* (Speg.) Niessl, *P. karachiensis* Mirza and Cain, *P. pyriformis* (Bayer) Cain and *P. inquinata* Ueda and Udagawa. Necessary comparisons have been made in the following.

The neck of the perithecium of *P. communis* (Speg.) Niessl is prominently longer as compared to *P. pseudoinquinata* sp. nov. The ascospores of *P. communis* (Speg.) Niessl (28-36x17-21 μm) are distinctly smaller as compared to our new species (40-55x30-40 μm). Over and above, the spores in *P. communis* (Speg.) Niessl has 4 secondary appendages at both ends of the ascospore, whereas, *P. pseudoinquinata* sp. nov. has only 1 secondary appendage at each end of the ascospore. On the basis of these grounds *P. pseudoinquinata* sp. nov. is considered altogether a different species.

Perithecium of *P. pyriformis* (Bayer) Cain (800-1200x500-700 μm) is much larger as compared to subglobose perithecium of *P. pseudoinquinata* sp. nov. (400-650x400-600 μm). The perithecium is hairless in the case of *P. pyriformis* (Bayer) Cain whereas in *P. pseudoinquinata* sp. nov. the perithecial body is covered with smooth walled septate, branched hairs. The asci in *P. pyriformis* (Bayer) Cain are much longer (400-450x45-65 μm) as compared to *P. pseudoinquinata* sp. nov. (190-250x45-55 μm). On these grounds *P. pyriformis* (Bayer) Cain and *P. pseudoinquinata* sp. nov. are considered altogether different.

The perithecium in *P. karachiensis* Mirza and Cain is bare, whereas in *P. pseudoinquinata* sp. nov. the entire body of the perithecium is covered with hairs. In *P. karachiensis* Mirza and Cain the neck of the perithecium is covered with hairs whereas in *P. pseudoinquinata* sp. nov. the neck is without hairs.

The ascospores in *P. karachiensis* Mirza and Cain are very small in size (16-30x12-19 μm) as compared to *P. pseudoinquinata* sp. nov. (40-55x30-40 μm). Due to the differences in perithecium and drastic differences in spore size *P. karachiensis* Mirza and Cain and *P. pseudoinquinata* sp. nov. are considered altogether different species.

Podospora inquinata Udagawa and Ueda [5] reported on marine sediments from Nagasaki Bay, Japan is the closest one to our new species. It is important to note that the substrate for both the species is distinctly different. The perithecia of *Podospora inquinata* have been reported as pyriform, whereas, in *P. pseudoinquinata* they are sub-globose. Besides the difference in the shape of perithecio of the two species, there is corresponding difference in their measurements (*P. inquinata* 400-500x280-400 μm , *P. pseudoinquinata* 400-650x400-600 μm); in *P. inquinata* the lower portion of the perithecium is covered with scattered flexuous hairs, whereas, in *P. pseudoinquinata* abundant hairs are present on the entire body of the perithecium excluding the neck. The hairs are septate, branched and measure 400-600 x 2.5-3.0 μm . As far as the measurements of asci are concerned, *P. pseudoinquinata* distinctly differs from those of *P. inquinata*.

The ascospore measurements are 40-55 (-60)x30-40

(-45) μm for *P. pseudoinquinata* and (22.5-) 25-30 (-34) x (15-) 18-20 (-25) for *P. inquinata*. In addition to the difference in size, very often the ascospores in *P. pseudoinquinata* are found to be relatively wider, as regards the length and width ratio of the ascospores. These spores are rounded at the upper end. Keeping in view the differences found between the two species particularly the difference in size of asci and ascospores as well as the overall shape of the ascospores, the establishments of *P. pseudoinquinata* is justified.

References

1. J. H. Mirza and R. F. Cain, *Can. J. Bot.*, **47** (12), 1999 (1969).
2. N. Lundqvist, *Mycol.*, **LXVI** (4), 725 (1978).
3. R. S. Khan and R. F. Cain, *Can. J. Bot.*, **50** (8), 1649 (1972).
4. S. I. Ahmed and F. Asad, *Pak. j. sci. ind. res.*, **11**, 57 (1968).
5. S. Udagawa and S. Ueda, *Mycotoxin*, **22**, 399 (1985).

12 mg/L (12-1 mg/L) were obtained for endosulfan against adult *A. mellifera* (slope 3.79, 0.44). The current recommended application rate of endosulfan against *B. bibax* in Australia is 25 mg/100L or 200 mg/L. Although earlier data [7] indicate that immature *A. mellifera* would survive this rate, this study suggests that adults would not. Recent studies on the toxicity of endosulfan to adult *B. bibax* indicate that field rates of 8-10 mg/100L may be effective (James unpubl. data). This corresponds to a dosage rate of around 28-35 mg/L which based on the bioassay data presented here, is unlikely to kill 100% of *A. mellifera* adults.

There are many difficulties in predicting the field performance of pesticides from laboratory bioassay data. However, laboratory bioassays tend to "over-emphasize" toxicity ratings because factors which may reduce the efficacy of a chemical in the field (e.g. application problems, weathering of residues) do not interfere with the assessment. Therefore, it is likely that a field rate of endosulfan around 35 mg/L would allow some survival of adult *A. mellifera*. It is possible that rates of endosulfan near the L.C₅₀ might have significant sub-lethal effects on longevity, fecundity and sex ratio of *A. mellifera* [10]. This study and earlier research [7] indicate that the application of low rates of endosulfan for control of *B. bibax* on citrus is compatible with survival of *A. mellifera*. The alternative chemical treatments for *B. bibax* (metadathion and malathion, are not effective at low rates (James unpubl. obs.) and are documented as being highly toxic to all stages of *A. mellifera* [7,11].

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Key words: Endosulfan, *Aphytis mellifera*, Toxicity.

References

1. Dr. Rosen, *Armoured Scale Insects*, Their Biology, Natural Enemies and Control (Elsevier, Amsterdam, 1990), Vol. B.
2. P. DeBach, D. Rosen and C. E. Kennell, *Biological Control*, C. B. Huffaker (ed.) (Plenum Publishing

Aphytis mellifera De Bach is a major biological control agent of citrus red scale, *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae) in Australia and in many other citrus growing regions of the world [1]. Although the degree of control provided by *A. mellifera* ranges from partial to complete in different citrus growing areas, its effectiveness is severely impeded by the use of insecticides [2, 3]. In recent years endosulfan as insecticide has been used on citrus in those areas to control spined citrus bug, *Biportus* *bibax* Fredlin (Hemiptera: Pentatomidae). The use of this compound in citrus is likely to increase because of its incorporation in an integrated pest management (IPM) program for *B. bibax* based on wasp parasitoids and pheromones [4-6]. The toxicity of 20 pesticides to *A. mellifera* was examined [7] and endosulfan shown to be safe to immature stages of the wasp. No assessment was made of direct endosulfan spray toxicity to adult *A. mellifera* which are most susceptible to contact pesticides [1]. This laboratory study was conducted to determine the dose/mortality relationship between adult *A. mellifera* and endosulfan and to compare this with proposed field rates for *B. bibax* control.

Adult *A. mellifera* were obtained from parasitized olivander scale, *A. aurantii* *nevi* Bouček, reared on butterfly papilionid. Wasps were held at 22°C for up to 10 days before bioassay. CO₂ anaesthetized wasps were transferred to disposable plastic cups (30 ml) (25-30 per cup) capped with muslin gauze upon which a drop of undiluted honey was provided. A 350 μL emulsifiable concentrate formulation of endosulfan was tested against *A. mellifera* using a Potter spray tower. Wasp activity was reduced by placing the cups in cool city (5-10°C for 10-15 mins) which allowed safe removal of lids prior to spraying. Four or five serial dilutions were used and 2 ml of liquid was sprayed onto one cup per concentration. The spraying pressure was 50 kPa and provided even coverage of bottom and sides of cups. Once a dose/mortality range was identified the test was replicated 3 times and a water only treatment was included in each replicate as a control. After spraying, the cups were placed at 22°C under 12L:12D. Mortality