

## ZYGOSPORIUM GIBBUM VAR. MANGIFERA VAR. NOV. ON MANGIFERA INDICA FROM SHUJABAD PAKISTAN

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### Abstract

*Zygosporium gibbum* var. *mangiferae* var. nov. is described. Illustrated and compared with other species of *Zygosporium* on *Mangifera indica* from Shujabad, Pakistan.

### Introduction

*Mangifera indica* is a fruit plant belonging to family Anacardiaceae. People of the tropical area consider it as a king of fruits. It is native of South East Asia (Khan, 1989). Pakistan is one of the main country where mango is cultivated on a large area. There are many varieties of mango that are famous for their taste and flavor in the world like Sindri, Langra, Daceri, Bangan phalli, Chonsa and Anwar rettol etc. The export of mango touches the figure to 110,000 tonnes in 2007-2008 (www.dailytimes.com). In spite of its use as ripe fruit, it is used for juices, jams, chatni, pickles and mango papri crackers etc.

A number of compilations on diseases of mango are present in literature. Singh (1960) discussed cultivation, utilization and common diseases of mango. Brodrick (1971) and Hepting (1971) described some of its important diseases. Kausar *et al.*, (1960) discussed some of important diseases of mango from Pakistan and India. Khan (1989) discussed pathogenic and non pathogenic diseases of mango from all over the world including Pakistan.

More than 46 fungi have been reported on mango from all over the world and more than half of them are reported from India (Khan 1989). Twenty two fungal and one bacterial diseases of mango have been reported from Pakistan (Ahmad *et al.*, 1997; Ghafoor & Khan, 1976; Khan, 1989).

Genus *Zygosporium* was erected by Montagne based on *Z. oscheoides*, Mont *Annls Sci. Nat., Bot., sér. 2* 17: 121 (1842). This genus is characterized by having dark black or brown, curved cell (vesicle) like sign of interrogation on short or long stalk.

Twenty-five species have been described in the genus *Zygosporium* (Kirk, 2010). Generally species are saprophytic but *Zygosporium majus* Pirozynski was reported to be parasitic on leaves of *Brillantaisia patula* (Ellis, 1976). Zygosporin, an antibiotic was also produced by *Z. masonii* Hughes (Minato & Matsumoto, 1970; Hayakawa *et al.*, 1968). *Zygosporium gibbum* on *Mangifera indica* was reported from Taiwan (Matsushima 1980).

Mason (1941) treated *Z. mycophilum* (Vuill.) Sacc., as a synonym of *Z. parasiticum* (Grove) Bunting & Mason but Hughes (1951) considered both taxa separate. However he considered *Zygosporium parasiticum* as synonym of *Zygosporium gibbum*. Ellis (1971) and Whitton *et al.* (2003) were also of the same opinion.

*Zygosporium parasiticum* was reported by Ahmad (1963) on *Euonymus pendulus* from Ghoragali (Muree) Pakistan. However fungal specimen received from Pakistan at IMI sent by Sultan Ahmad on *Euonymus pendulus* was reported as *Zygosporium parasiticum*. Ahmad (1963) later on in IMI it was identified as *Zygosporium gibbum*. The details of specimens present in IMI are as follows.

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*Zygosporium gibbum* on leaf of *Euonymus pendulus*, Pakistan, S. Ahmad No. 16055 13/4/1962, IMI100217B; and on leaf of *Euonymus pendulus*, Pakistan, S. Ahmad No.15538,14/4/1962,IMI 93333c, Ellis (1971), IMI database, <http://backup.herbimi.info>.

*Zygosporium gibbum* on leaf of *Quercus ilex*, Pakistan, P.M. Kirk, 5/08/1982. IMI274682a. IMI database <http://backup.herbimi.info>.

## Materials and Methods

The fungus under study was found on ventral side of leaves of *Mangifera indica* from Shujabad Pakistan, forming small black spots, looking like pycnidia or ascocarp by naked eyes. However, under stereomicroscope (Meiji Ultra Swift Lite, SM 80, Japan) aggregation of mycelia and conidiophores became evident. Slides were prepared by taking a small piece from it under stereomicroscope on glass slides, teased and spread with the help of needle. Drop of water or lactophenol was put on it and a cover slip was plant and observed under calibrated binocular microscope (Swift M7000D, Japan). Photographs were taken with Sony camera (T 20 8.1 megapixels) and measurement were made.

## Results and Discussion

**Description of the fungus under study:** Mycelium septate branched and brown 6 µm wide spread on lower epidermis of leaf of *Mangifera indica* in the form of small black spots. Conidiophore 1-2 septate 10x5-6 µm, brown and subtented by a sub hyaline triangular (laginifrom cell) 10 µm in height and 8x16 µm wide, probably it is ruptured lower cell of conidiophores and a curved, dark black, solitary cell is present at the top of stalk cells called vesicle 10-16x4-7 µm. Vesicle has one conidiogenous cell 4-6 µm. hyaline, fusiform and monoblastic at the narrow and curved end of vesicle. There is also a hyaline to sub hyaline, cylindrical, strile cell is present at the top of vesicle 4-7x3-4 µm. Conidia hyaline spherical, dry, smooth 4-8µm diam.

Holotype *Z. gibbum* var. *Mangiferae* var nov. Abbas, Iftikhar, Niaz & Abbas on leaves of *Mangifera indica*, Shujabad, Pakistan.G.C.U.M.H.No.60, 22<sup>nd</sup>, April 2009.

**Latin description:** Mycelium superficiale, cylindricae, pallidae brunneae, laevia, septatis, ramose, 6 µm diam. Conidiophora cylindricae 1-2 septata, erecta, brunnea, leevia, crassitunicata 10 x 5-6 µm. Cellulae basim triangularea, subhylinea 10x8-16 µm. Cellulae vesicula brunnea et atro brunnea, canalus inflata, introrsus curvata 10-16x4-7 µm. Cellulae conidiogenae. singulae, monoblastica, descretae, inflatae, ampulliformae, laeviae, hyalinae 4-6 µm et cellulae vesiculae ad apiceum dorso-curvatae a strilae cellulae cylindricae, sub hyalinae 4-7 µm. Conidia solitria, secca, sphaerica, aseptata hyalinae. 4-8µm diam.

Holotypus *Z. gibbum* var. *Mangiferae* var nov. Abbas, Iftikhar, Niaz & Abbas et folia *Mangifera indica*, Shujabad, Pakistan.G.C.U.M.H.No.60, 22<sup>nd</sup>, April 2009.

The fungus under study closely resembled with *Zygosporium gibbum* (Sacc., Pouss & Bomm) Hughes, after consultation with Ellis (1971, 1976); Hughes (1951); Mason (1941); Wang & Baker (1967).

*Zygosporium gibbum* can easily be differentiated from *Z. masonii* Hughes, where vesicle are in chain and conidia are ellipsoidal, smooth, ellipsoidal and hyaline to pale brown 7-12 µm.

*Z. echinosporium* Bunting & Mason, *Z. minus* Hughes, *Z. oscheoides* Mont, *Z. majus* Pirozynski and *Z. geminatum* Hughes, *Z. anupamvarmae* Manoharachary, Agarwal,

Sureshkumar, Kunwar and Sharath Babu (2006), *Z. bioblitzii* Mckenzie, Thongkantha & Lumyong are the species where vesicle are short stalked and lateral in position whereas in *Zygosporium gibbum* vesicle is terminal and conidia are spherical, smooth 4.5-6  $\mu\text{m}$ . diam. In *Z. echinosporium* conidia are spherical and hyaline 6-9  $\mu\text{m}$  diam., and are bigger than *Z. gibbum*.

Conidia in *Z. oscheoides* are ellipsoidal hyaline to pale brown, smooth to minutely verruculose 7-12 x 4-7  $\mu\text{m}$ . and slightly more bigger than *Z. gibbum*. In *Z. geminatum* conidia are ellipsoidal, golden brown, verrucose and are in pairs 20-30 x 8-11  $\mu\text{m}$ ., which are more longer and wider than the conidia of *Z. gibbum*. *Z. mycophilum* (vuill) Sacc., conidia are ellipsoidal, hyaline, smooth 5-10 x 4-6 $\mu\text{m}$ ., having more bigger conidia than *Z. gibbum*. In *Z. deightonii* Ellis, conidia are ellipsoidal, hyaline and smooth (9-15 x 6-9  $\mu\text{m}$ ), thus clearly differ from *Z. gibbum*.

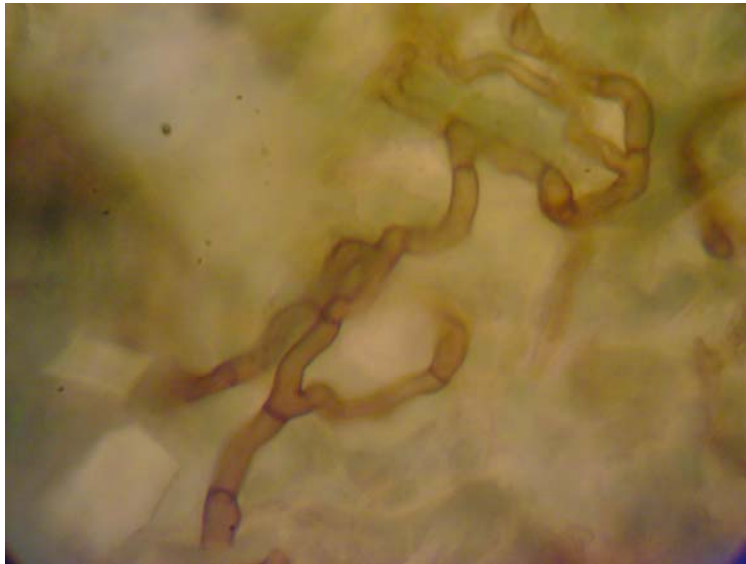


Fig. A. *Z. gibbum*: Septate mycelium 400X

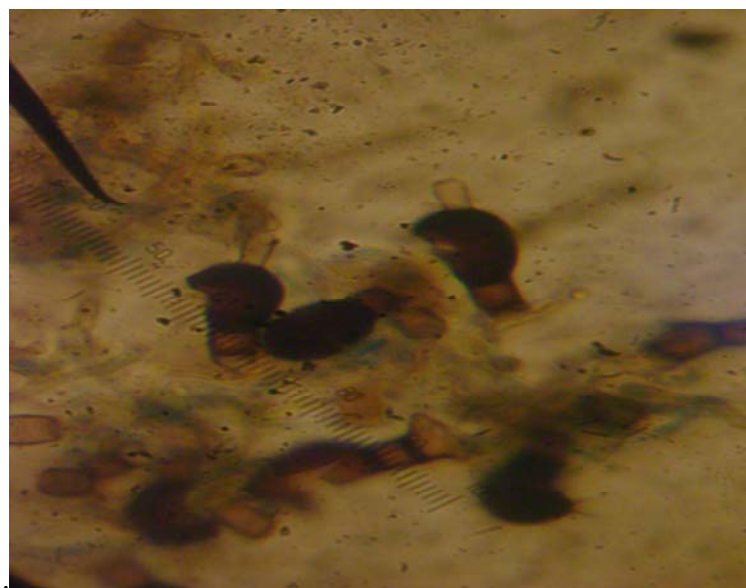


Fig. B. *Z. gibbum*: Septate conidiophores (1000X).



Fig. C. *Z. gibbum*: Strile cylindrical cell at the top of vesicle & conidiogenous cell on the pointed end (1000X).

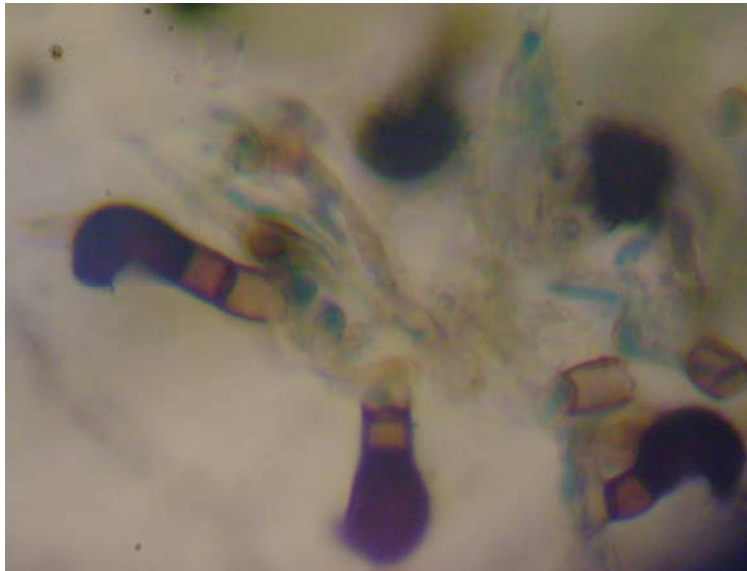


Fig. D. *Z. gibbum*: conidiophores cells (1000X).

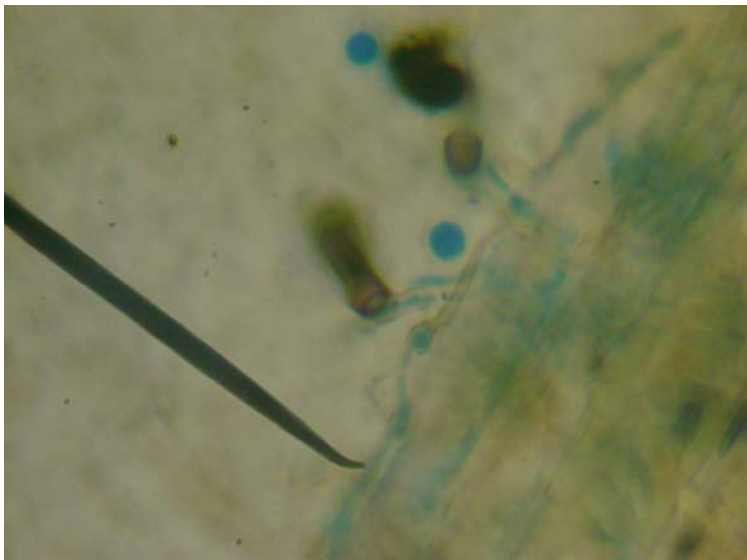


Fig. E. *Z. gibbum*: Spherical hyaline spore.

However, *Z. echinosporium*, *Z. minus*, *Z. echinosporium*, *Z. majus* resemble with *Z. gibbum* in having spherical conidia. But *Z. gibbum* differs from *Z. majus* where conidia are more bigger and verrucose 13-18µm diam. and conidiophores 100 µm. long. Vesicle on lateral side single 14-20 x 8-12 µm, Conidiogenous cells 2 8-10 x 6-9 µm. Conidia spherical verrucose, pale straw coloured 13-18µm in diam.

In *Z. minus* conidiophores subulate up to 50 x 1-3 µm., vesicle on lateral side at the base of conidiophores. Conidiogenous cells in pairs, conidia are spherical, hyaline to pale brown, verrucose 6-9µm in diam. and conidia are bigger than *Z. gibbum*. In *Z. echinosporium*, conidiophore are up to 300 µm long, several vesicle are borne laterally on a long stalk with a sterile apical region ends to hyaline knob like structure 5-7 µm. Conidia hyaline, spherical, verrucose 6-9 µm. and more bigger than *Z. gibbum*. *Z. anupamvarmae* also differs from *Z. gibbum* in having lateral vesicle, substended by a single stalk cell, two conidiogenous cells and conidia are broadly falcate, apex and base broadly pointed, pale brown with 2-5 µm longitudinal striations 14.5-25x5-6.5 µm. *Z. bioblitzii* also differs from *Z. gibbum* in having vesicle at lateral side with two conidiogenous cells and conidia ellipsoidal to oval, brown, 14-21x7.5-11 µm. solitary, unseptate, apex obtuse and base truncate with a projection and wall thick covered by brown, raised flattened out growths arranged in the form of ridges.

Fungus under study closely resembled with *Z. gibbum* in conidial dimension but it differs in that vesicle is substended by 1-2 septate stalk, (two to three celled) 10-20 µm. Furthermore the basal cell (probably ruptured cell) is triangular, hyaline and more bigger and wider 10 x 20µm. In *Z. gibbum* stalk cell is single celled and vesicle has 2-3 separate conidiogenous cells and one cylindrical, pale brown cell, whereas in the fungus under study, vesicle is 7-16 x 5-7 µm. with only one conidiogenous cell hyaline, sub cylindrical to fusiform situated at the narrow curved bend of vesicle. Furthermore it has also another sterile cylindrical, hyaline to sub hyaline cell on the top of vesicle. All these are sufficient to accommodate the fungus under study as a new variety *Z. gibbum* var. *Mangiferae*.

**Specimen examined:** *Z. gibbum* var. *mangiferae* var nov. Abbas, Iftikhar, Niaz & Abbas on leaves of *Mangifera indica*, Shujabad, Pakistan. G.C.U.M.H.No.60, 22<sup>nd</sup> April, 2009.

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