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## GIGASPORA MARGARITA, A NEW SPECIES IN THE ENDOGONACEAE

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In 1972, a soil sample from a soybean field on the Agronomy South Farm, University of Illinois Urbana, was wet-sieved and found to contain both white spores and yellow *Gigaspora* spores greater than 233  $\mu\text{m}$ . Initially the white spores were considered immature spores of *Gigaspora gigantea* (Nicol. & Gerd.) Gerd. & Trappe (*Endogone gigantea* Nicol. & Gerd.). The white spores were collected and maintained in a pot culture. After three years of pot culturing on different hosts, yellow spores have not been found in pots inoculated with white spores. Furthermore, as determined from pot cultures started with yellow spores, the immature spores of *G. gigantea* are yellow and not white. We also found that the white-spored species differed in other respects from all of the five described species of *Gigaspora* (Gerdemann and Trappe, 1974).

*Gigaspora margarita* Becker & Hall, sp. nov.      Figs. 1-6

Azygosporae singillatim in solo efformatae, globosae, 260-480  $\mu\text{m}$  diametro, vel in solo compacto irregulares. Tunica sporarum levis, hyalina, e 4-8, raro 10 laminis, pluribus in maturioribus, efformata, 5-24  $\mu\text{m}$  crassa, lamina quaque 1.5-4  $\mu\text{m}$  crassa. Sporarum contentus albus, e guttulis oleosis minutis multis denique coalescentibus constitutus. Sporae directe per tunicam prope basim germinantes. Sporae terminales in hyphis sustentibus productae. Hypha sustinens plerumque sub cellula instar suspensoris septata. Cellula instar suspensoris, 27-58  $\mu\text{m}$  lata, hyalina vel pallide brunnea, levis, tunica 1-5  $\mu\text{m}$  crassa, juxta sporam crassior. In solo vesiculae plerumque

in hyphis spiratis singillatim vel in glomerulis compactis usque ad 20 numero, 22-35  $\mu\text{m}$  diametro efformatae, juveniles tenuiter tunicatae, albae, maturiores pallide brunneae et prominentiis verruciformibus usque ad 4  $\mu\text{m}$  altis, 5  $\mu\text{m}$  latis ornatae. In radicibus endomycorrhizas cum arbusculis efformans.

Azygospores formed singly in the soil, globose, or irregular in compacted soils. Globose spores 260-480  $\mu\text{m}$  diam. Spore wall smooth and hyaline, composed of 4-8, rarely 10, fused laminations, the number of laminations increasing with age. Spore wall 5-24  $\mu\text{m}$  thick in mature spores, each lamination 1.5-4  $\mu\text{m}$  thick. Contents of spores white, composed of many small oil droplets which tend to coalesce with age particularly in germination regions. Spore germination directly through the spore wall near the base. Spores terminal on the subtending hypha. Subtending hypha generally septate below the suspensor-like cell. Suspensor-like cell, 27-58  $\mu\text{m}$  broad, hyaline to light brown, smooth, walls 1-5  $\mu\text{m}$  thick, thicker at the point of attachment to the spore. Vesicles formed in the soil usually on coiled hyphae, singly or in tight clusters of up to 20, 22-35  $\mu\text{m}$  diam., thin-walled and white when young, turning light brown with age and becoming covered with warty projections up to 4  $\mu\text{m}$  high and 5  $\mu\text{m}$  wide. Forms endomycorrhizae with arbuscules.

DISTRIBUTION, HABITAT, AND SEASON: Known from agricultural fields in east central Illinois and from a virgin sand prairie in central Illinois. Probably widespread in the midwestern states and present in soil throughout the year. Reportedly common in Florida (T. H. Nicolson, personal communication) and recently collected in the Waikato area of the North Island, New Zealand (Hall, 1976). The Illinois isolate is also very similar or identical to a species collected by M. J. Hattings in South Africa.

MYCORRHIZAL ASSOCIATIONS: This species formed arbuscular endomycorrhizae in pot cultures with *Allium cepa* L., *Glycine max* (L.) Merr., *Lycopersicon esculentum* Mill., *Sorghum sudanense* (Piper) Staph. and *Zea mays* L.

ETYMOLOGY: Latin, *margarita* (pearl), referring to the large pearly white globose spores.

COLLECTIONS EXAMINED: TYPE: ILLINOIS - Champaign Co., University of Illinois, Agronomy South Farm, field # 1101, inoculum from a soybean field mixed with autoclaved soil and planted with soybeans, spores retrieved February 9, 1976, Becker 01 (OSC).

*Gigaspora margarita* is readily distinguished from other members of the genus in having white spores (Fig. 1) with laminated walls (Fig. 2) and white clustered warty vesicles (Fig. 3).

The shape of the spores, vesicles and arbuscules (Fig. 4) of *G. margarita* are similar to those of *G. gigantea* (B spores, Gerdemann, 1955; Nicolson and Gerdemann, 1968), but the differences in the color and the structure of the spore wall readily distinguish the two species. *G. gigantea* is yellow and has a thin outer wall tightly covering an inner wall while *G. margarita* is white and has a spore wall consisting of several laminations.

*G. margarita* differs from *G. gilmorei* primarily in spore wall structure and spore germination. While *G. gilmorei* has a complex wall consisting of five layers of widely varying thickness which easily separates into an inner and outer wall (Gerdemann and Trappe, 1974), *G. margarita* has a wall with up to ten fused laminations 1.5 to 4  $\mu\text{m}$  thick which do not readily separate when spores are crushed (Fig. 2). The innermost layers of the spore wall of *G. margarita* do not separate into peripheral compartments prior to germ tube penetration of the outer wall (Figs. 5 and 6).

*G. margarita* is like *G. calospora* except the globose spores of *G. margarita* are generally larger than 300  $\mu\text{m}$  diameter and have laminated walls. The vesicles are usually borne in clusters rather than singly.

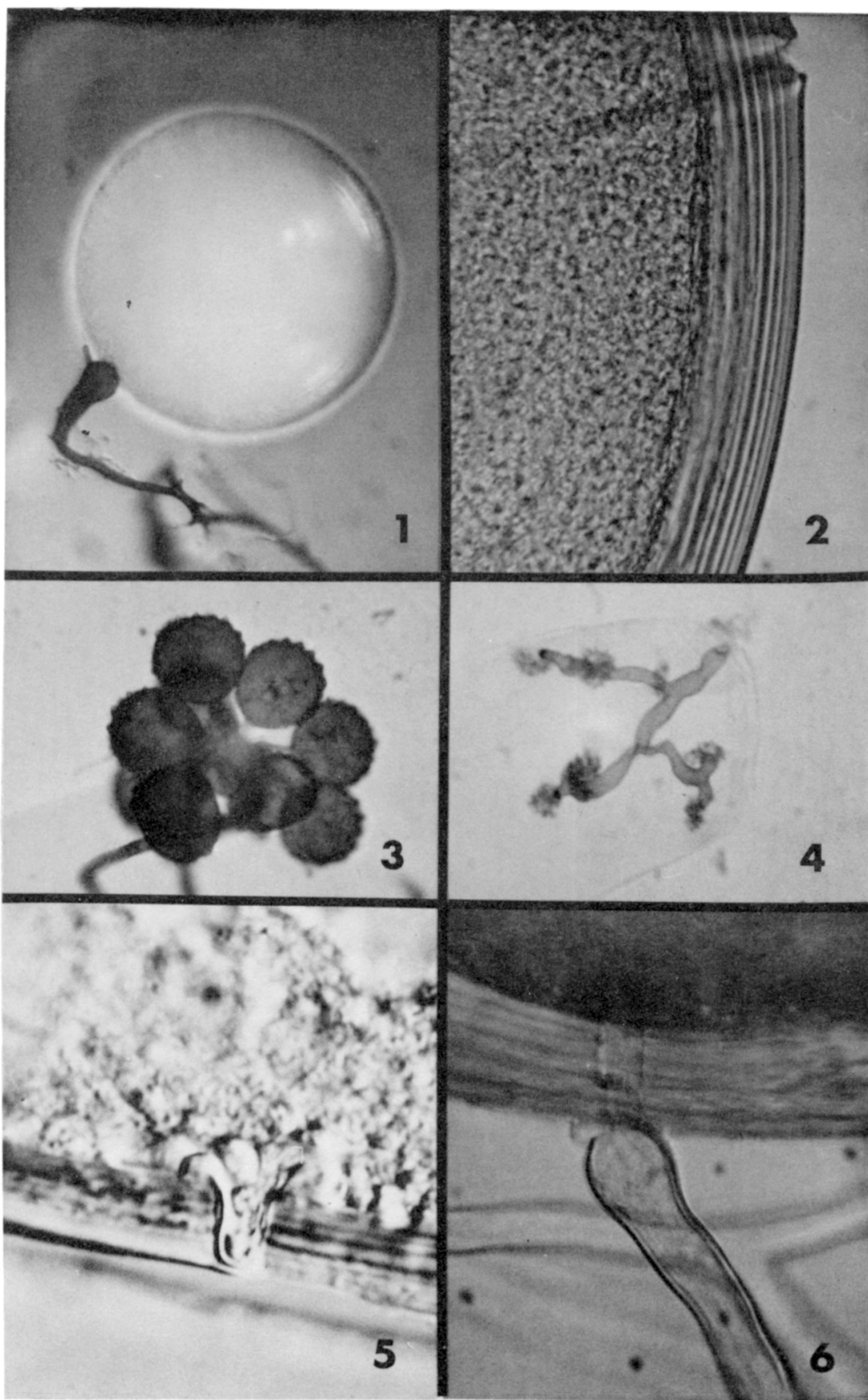
*G. coralloidea* and *G. heterogama* are brown-spored species and are readily distinguishable from the white-spored *G. margarita*.

## AMENDED KEY TO THE SPECIES OF GIGASPORA:

1. Azygospores white . . . . . 2
1. Azygospores not white . . . . . 3
  
2. Spore wall with distinct laminations of near equal width; spores germinate without forming peripheral compartments; vesicles white . . . . . *G. margarita*
2. Spore wall with inner and outer layers of unequal thickness; spores germinate from peripheral compartments; vesicles brown . . . . . *G. gilmorei*
  
3. Azygospores yellow, smooth . . . . . 4
3. Azygospores brown, with warts or minute spines . . . . . 5
  
4. Globose spores less than 300  $\mu\text{m}$  diam., pale yellow; vesicles smooth to knobby, formed singly . . . . . *G. calospora*
4. Globose spores greater than 300  $\mu\text{m}$  diam., bright yellow to greenish yellow; vesicles echinulate, formed in clusters . . . . . *G. gigantea*
  
5. Globose spores greater than 300  $\mu\text{m}$  diam., dark brown with hyaline warts; vesicles with coralloid projections . . *G. coralloidea*
5. Globose spores less than 300  $\mu\text{m}$  diam., light brown with minute spines; vesicles smooth . . . . . *G. heterogama*

FIGURES 1-6. *Gigaspora margarita*.

1. Mature azygospore,  $\times 114$ .
2. Laminated spore wall,  $\times 378$ .
3. Vesicles,  $\times 378$ .
4. Arbuscule,  $\times 378$ .
5. Section of a spore embedded in glycolmethacrylate resin showing young germ tube penetrating spore wall,  $\times 378$ .
6. Late stage in spore germination,  $\times 378$ . Note constriction of germ tube through the spore wall.



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