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BEHAVIOR OF A COMPOSITE ENDOMYCORRHIZAL INOCULUM IN THE LEEK RHIZOSPHERE

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Abstract

Eighty-five species were isolated from the rhizosphere of leek plants after five months of inoculation with a composite endomycorrhizal inoculum originating from the olive tree. Analysis of the endomycorrhizal fungi spore communities that were found in the rhizosphere of leek showed the predominance of the genus Glomus with an occurrence frequency of 40% followed by *Acaulospora* (21%) and finally *Gigaspora* and *Scutellospora* with the same frequency of (6%). In addition, a comparison between the AM fungi species of the initial inoculum (22 species) and those isolated revealed the appearance of 69 species and the non-sporulation of 6 species.

Key words : Leek, rhizosphere, composite endomycorrhizal inoculum, endomycorrhizal fungi, sporulation.

Introduction

In Morocco, Kachkouch *et al.,* (2014) noted that in the rhizosphere of the olive tree there is a presence of 26 endomycorrhizal species of which 12 species were determined : *Glomus etunicatum, G. proliferum, G. clarum, G. diaphanum, G. intraradices, G. mossaeae, G. constrictum, G. geosporum, G. versiforme, Glomus* sp.1, *Glomus* sp.2, *Glomus* sp.3, *Glomus* sp.4, *Glomus* sp.5, *Acaulospora denticulata*, *A. spinosa, Acaulospora* sp.1, *Acaulospora* sp.2, *Acaulospora* sp.3, *Acaulospora* sp.4, *Entrophospora kentinensis, Entrophospora* sp.1, *Gigaspora* sp.1, *Gigaspora* sp.2, *Gigaspora* sp.3, *Scutellospora* sp.1. All of these species were used, as a composite endomycorrhizal inoculum, to inoculate olive plants. After 30 months, Chliyeh *et al.,* (2016) reported the presence of only 22 species of AM fungi : *Acaulospora bireticulata, A. denticulata*, *A. foveata, A. spinosa, Entrophospora colombiana, Glomus mosseae, G. pansihalos, G. intraradices, G. macrocarpum, G. spurucum, G. trimurales, G. diaphanum, G. etunicatum, G. aggregatum*, *G. clarum, G. claroideum, G. multicaule, G. versiforme*, *G. fasciculatum, G. boreale, Gigaspora margarita*, *Scutellospora nigra*, which means that some species have sporulated and others have not settled over time in the rhizosphere of olive plants. A composite endomycorrhizal inoculum containing all these species and probably others represented as mycelium; they were used to inoculate leek plants, which is a very mycotrophic plant species. The main objective of this study is to know if the endomycorrhizal species, native to the rhizosphere of the olive tree, are able to grow in the rhizosphere of leek plants.

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Materials and Methods

A composite endomycorrhizal inoculum was prepared from the soil rhizosphere of the olive plants that were inoculated with an endomycorrhizal inoculum. Its origins are from the rhizosphere of olive trees growing in different parts of Morocco, so root samples were taken from these plants' seedlings. This inoculum consists of 22 endomycorrhizal species (Chliyeh *et al.,* 2016), and it has been grown under glass with leek plants.

The experimental setup was designed as a random block. Two lots of plants were made with seven plants for each lot.

Lot 1: Control plants (T).

Lot 2: Plants were inoculated with endomycorrhizal fungi (Myc) by filling half the pot with the inoculum in contact with the root system of the plant studied, the other half was filled with sand from the Mamora forest disinfected by autoclaving. The pots were installed in the greenhouse at room temperature and watered regularly with distilled water.

After five months of leek plants inoculation with the composite inoculum, the isolation of the mycorrhizal fungi spores was performed according to the wet sieving method described by Gerdemann and Nicolson (1963).

MA fungi were identified according to their morphological characteristics, and referring to the determination key of Schenk and Perez (1990) and the INVAM website. Spores of mycorrhizal fungi have been identified and estimated their number in 100 g of soil (spore density).

Results

Microscopic observations revealed the presence of Eighty-five species in the rhizosphere of leek plants after five months of their inoculation with a composite endomycorrhizal inoculum originating from the olive tree (Figs. 1, 2,3,4,5,6,7, 8; Table 1), with a spore density of 160 spores / 100g.

These species are: *Acaulospora denticulata, Claroideoglomus etunicatum, Claroideoglomus claroideum, Glomus intraradices, G. minutum, G. glomerulatum, Acaulospora delicata, Scutellospora calospora, Gigaspora candida, Glomus tortuosum, G. luteum, Acaulospora scrobiculata, A. mellea, A. trappei, Glomus rubiforme, Acaulospora* sp.1*, Glomus etunicatum, Rhizoglomus fasciculatum, Glomus macrocarpum, G. aggregatum, G. deserticola, Acaulospora foveata, A. colossica, Scutellospora biornata, Entrophospora infrequens, Glomus pansihalos, Septglomus constrictum, Glomus aureum, Paraglomus laccatum, Acaulospora gerdemannii, Glomus spinuliferum, Funneliformis geosporum, Glomus multicaule, Entrophospora kentinensis, Glomus hoi, G. occultum, G.monosporum, Scutellospora fulgida, Glomus perpusillum, G. arborense, G. clarum, Pacispora franciscana, Diversispora epigaea, Glomus leptotichum, Acaulospora colliculosa, Acaulospora rehmii, Pacispora* sp.*, Glomus fasciculatum, G. microcarpum, Ambispora* sp*, Viscospora viscosa, Glomus fecundisporum, G. diaphanum, Acaulospora* sp2*, Acaulospora capsicula, Acaulospora longula, Glomus formosanum, Gigaspora* sp1*, Acaulospora* sp3*, Acaulospora pustulata, Cetraspora helvetica, Scutellospora savannicola, Glomus versiforme, G.mosseae, Diversispora celata, Acaulospora laevis, Diversispora omaniana, Dentiscutata heterogama, Diversispora* sp*, Gigaspora margarita, Paraglomus majewskii, Glomus arenarium, Scutellospora spinosissima, Gigaspora* sp.2*, Entrophospora nevadensis, Acaulospora* sp.4*, Glomus claroideum, Ambispora leptoticha, Gigaspora decipiens, Glomus radiatus, Ambispora brasiliensis, Glomus muliticulae, Glomus fragilistratum, Glomus boreale, Rhizoglomus microaggregatum,* which belonged to 16 genera (*Glomus, Acaulospora, Gigaspora, diversispora, viscospora, Pacispora, Dentiscutata, Septoglomus, Paraglomus, Entrophospora, Scutellospora, Rhizoglomus, Ambispora, Claroideoglomus, Cetraspora, Funneliformis*).

The genus *Glomus* is the most dominant, with a frequency of occurrence of 40% followed by Acaulospora (21%), then *Gigaspora* and *Scutellospora* with the same occurrence frequency (6%) (Fig. 9).

Discussion

It is universally recognized that mycorrhizal fungi contribute effectively to the establishment and maintenance of plant species under very demanding and restrictive ecological conditions (Le Tacon *et al.*, 1987).

A comparison of different species of AM fungi isolated from the olive trees rhizosphere Kachkouch (2014), with those isolated from the leek rhizosphere, revealed the appearance of other 77species (*Claroideoglomus etunicatum, Claroideoglomus claroideum, Glomus minutum, Glomus glomerulatum, Acaulospora delicata, Scutellospora calospora, Gigaspora candida, Glomus tortuosum, Glomus luteum, Acaulospora scrobiculata, Acaulospora mellea, Acaulospora trappei, Glomus rubiforme, Acaulospora* sp.1*, Rhizoglomus fasciculatum, Glomus macrocarpum, Glomus aggregatum, Glomus deserticola, Acaulospora foveata,, Acaulospora colossica, Scutellospora biornata, Entrophospora infrequens, Glomus pansihalos, Septglomus constrictum, Glomus aureum, Paraglomus laccatum, Acaulospora gerdemannii, Glomus spinuliferum, Funneliformis geosporum, Glomus multicaule, Glomus hoi, Glomus occultum, Glomus monosporum, Scutellospora fulgida, Glomus perpusillum, Glomus arborense, Pacispora franciscana, Diversispora epigaea, Glomus leptotichum, Acaulospora colliculosa, Acaulospora rehmii, Pacispora* sp*, Glomus fasciculatum, Glomus microcarpum, Ambispora* sp*, Viscospora viscosa, Glomus fecundisporum, Acaulospora* sp.2*, Acaulospora*

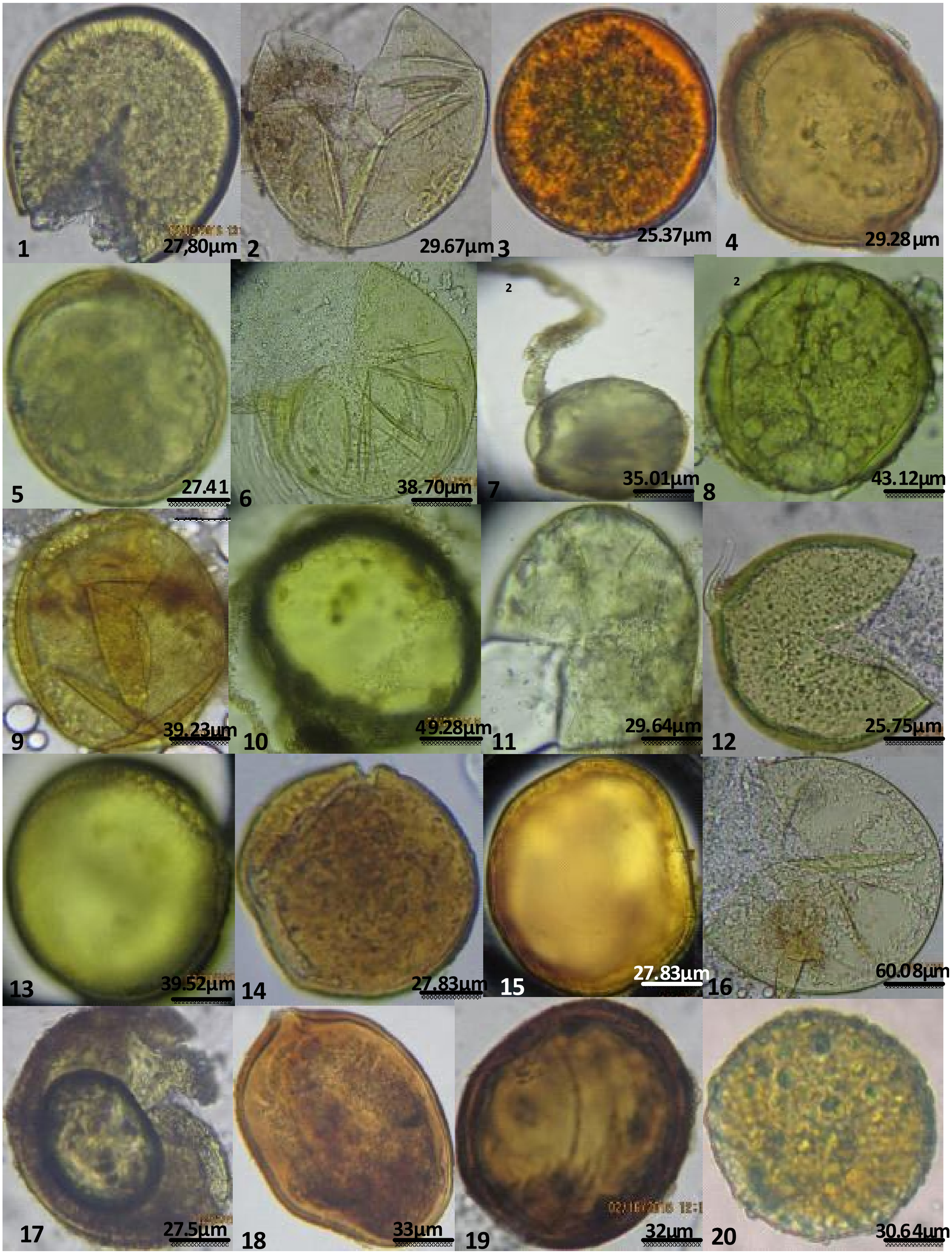


Fig. 1: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

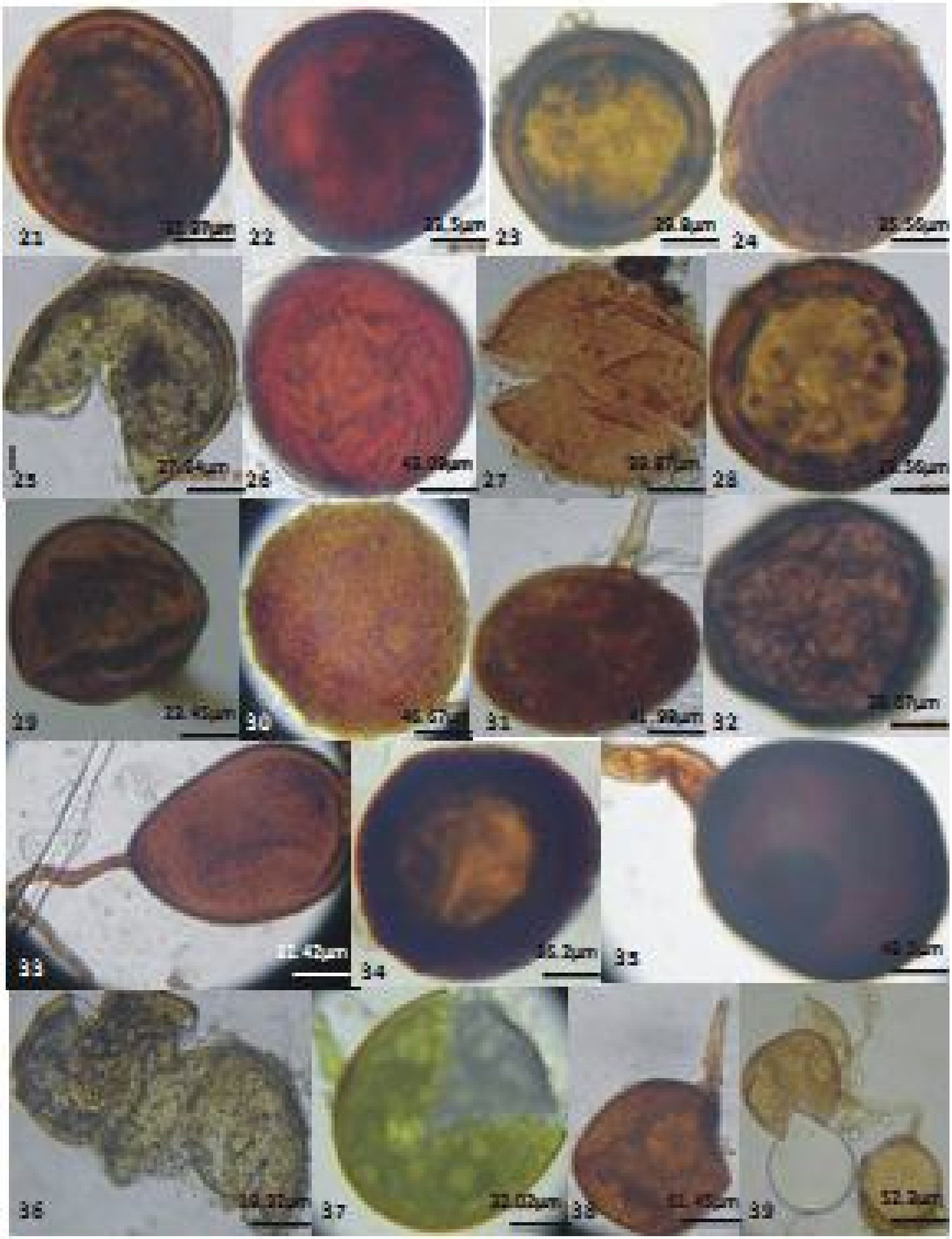


Fig. 2: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

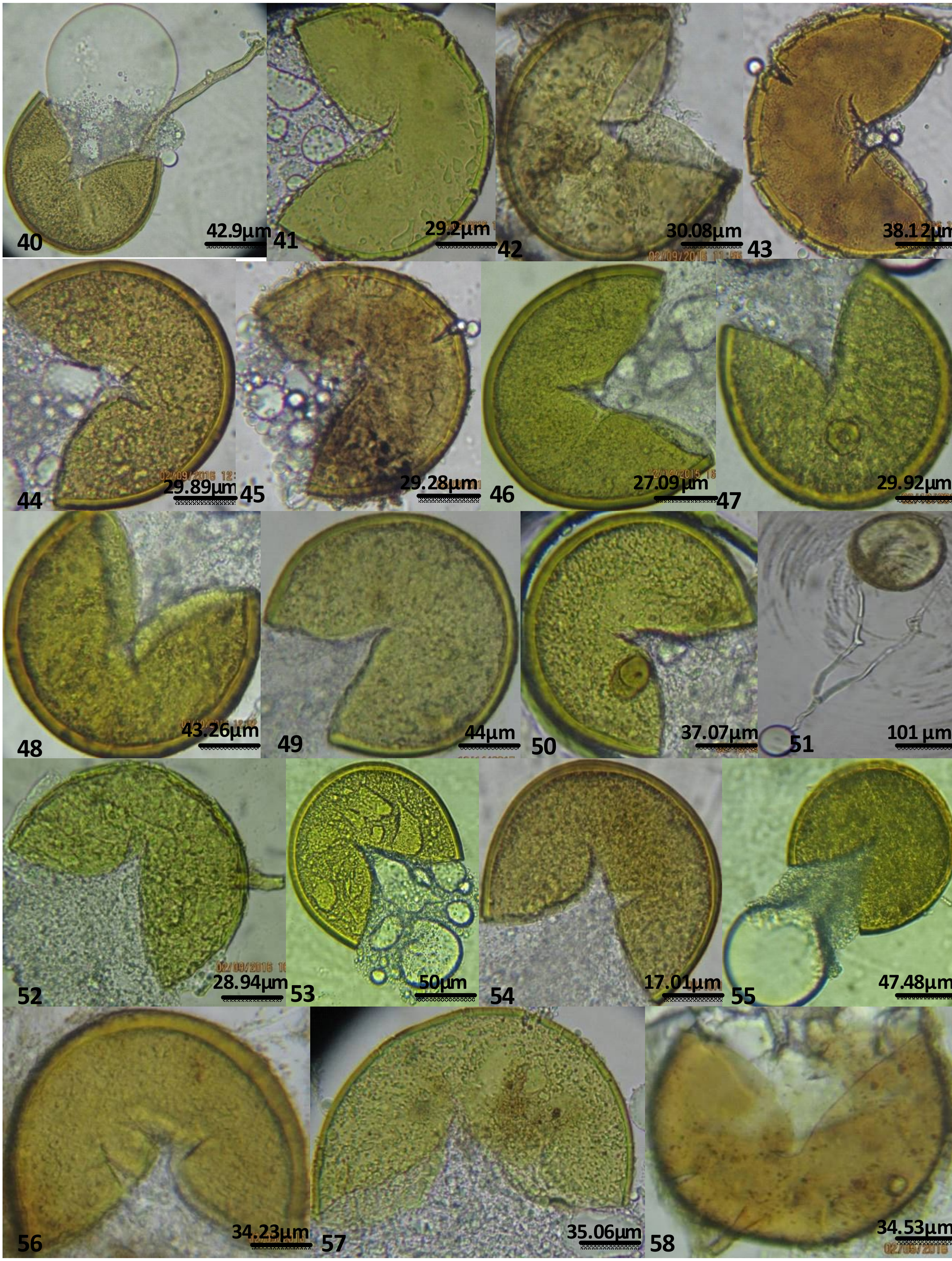
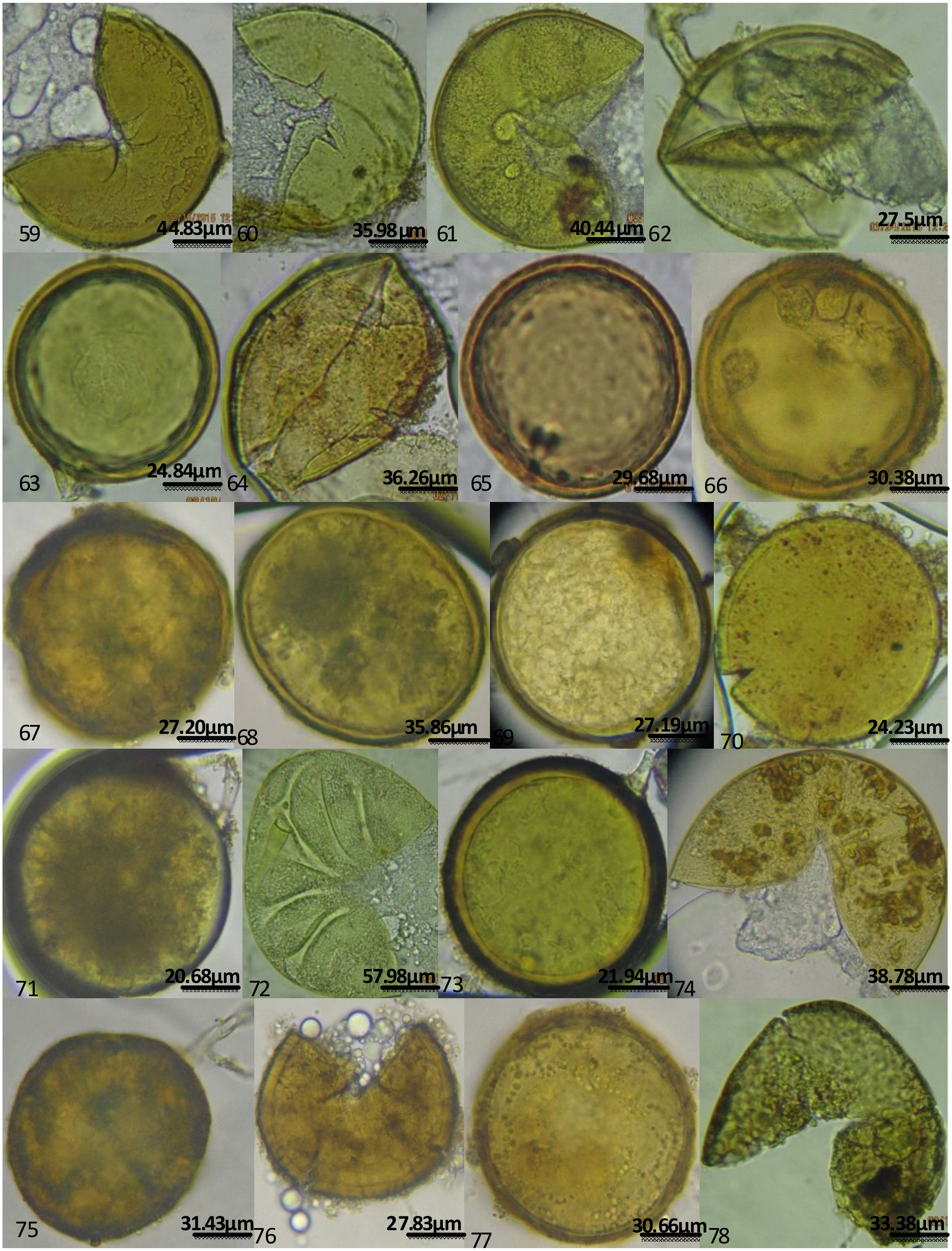


Fig. 3: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.



79

Fig. 4: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

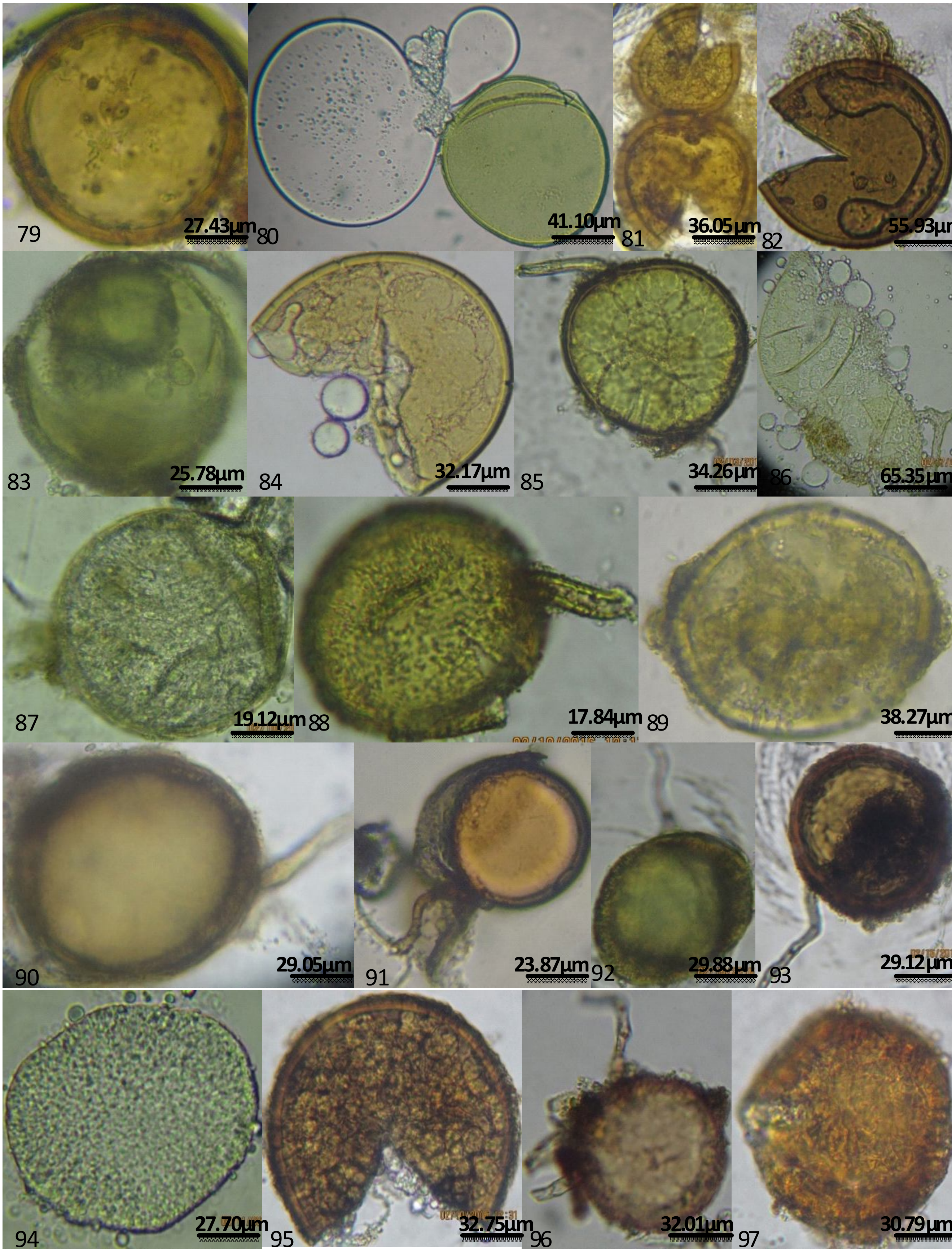


Fig. 5: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

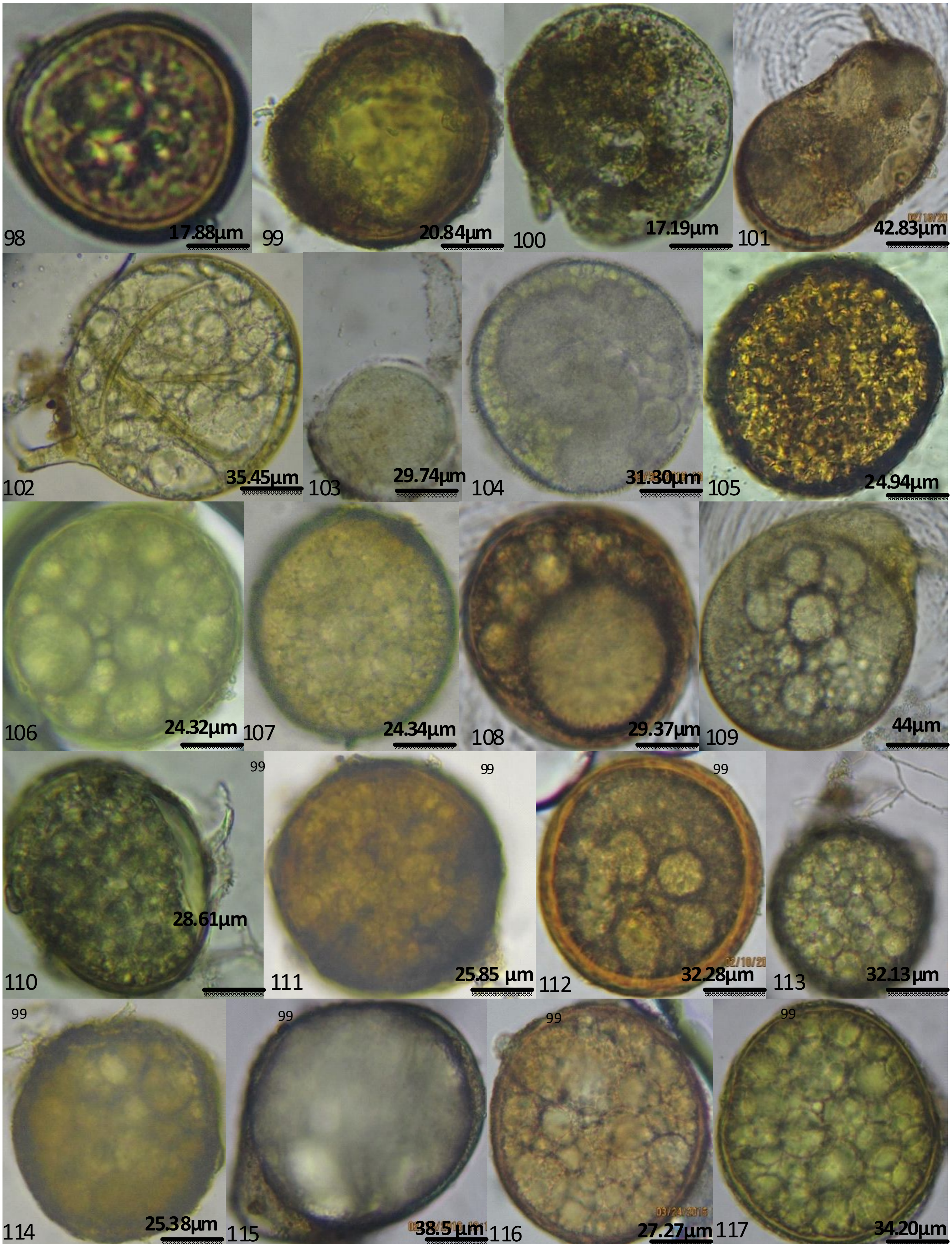


Fig. 6: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

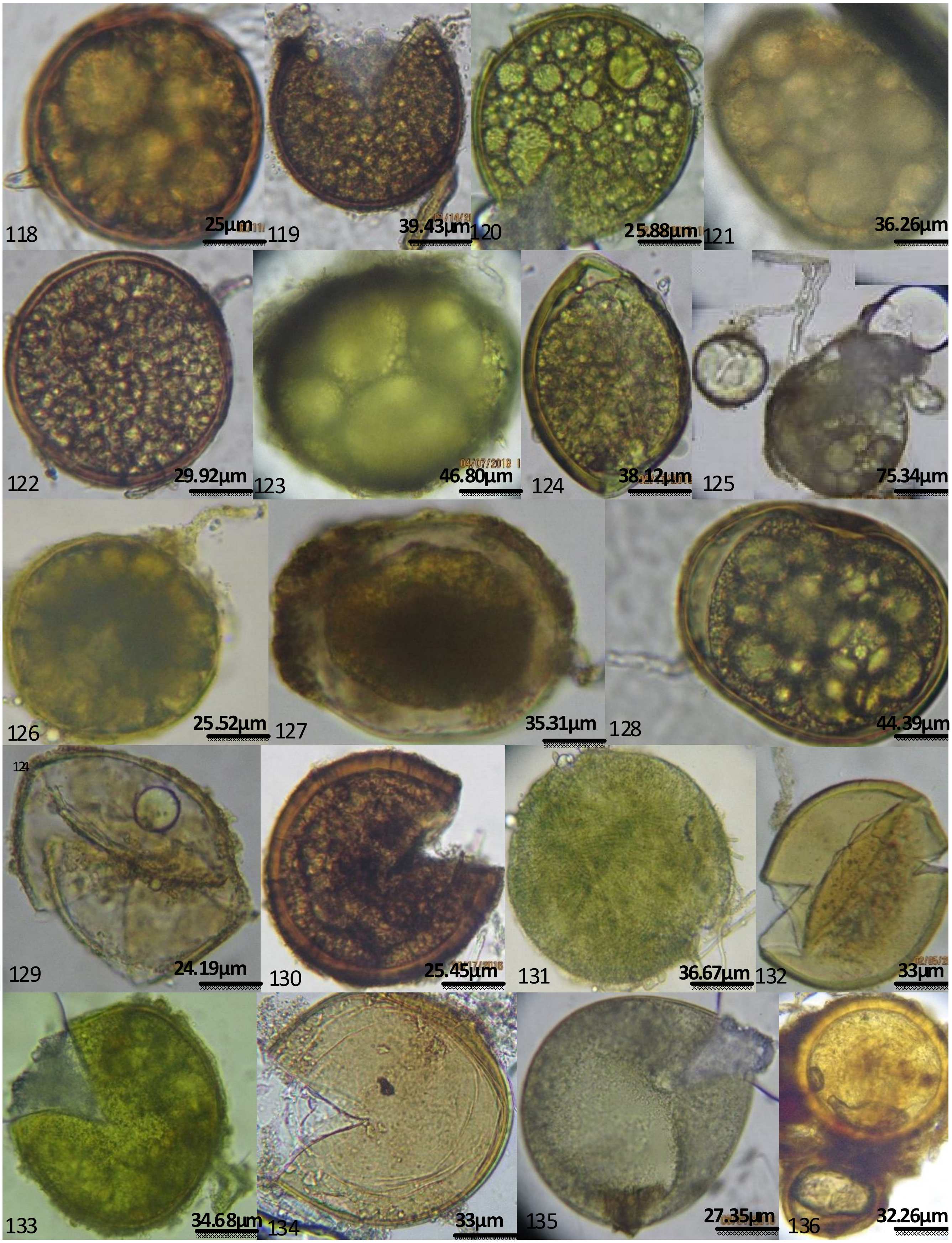


Fig. 7: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

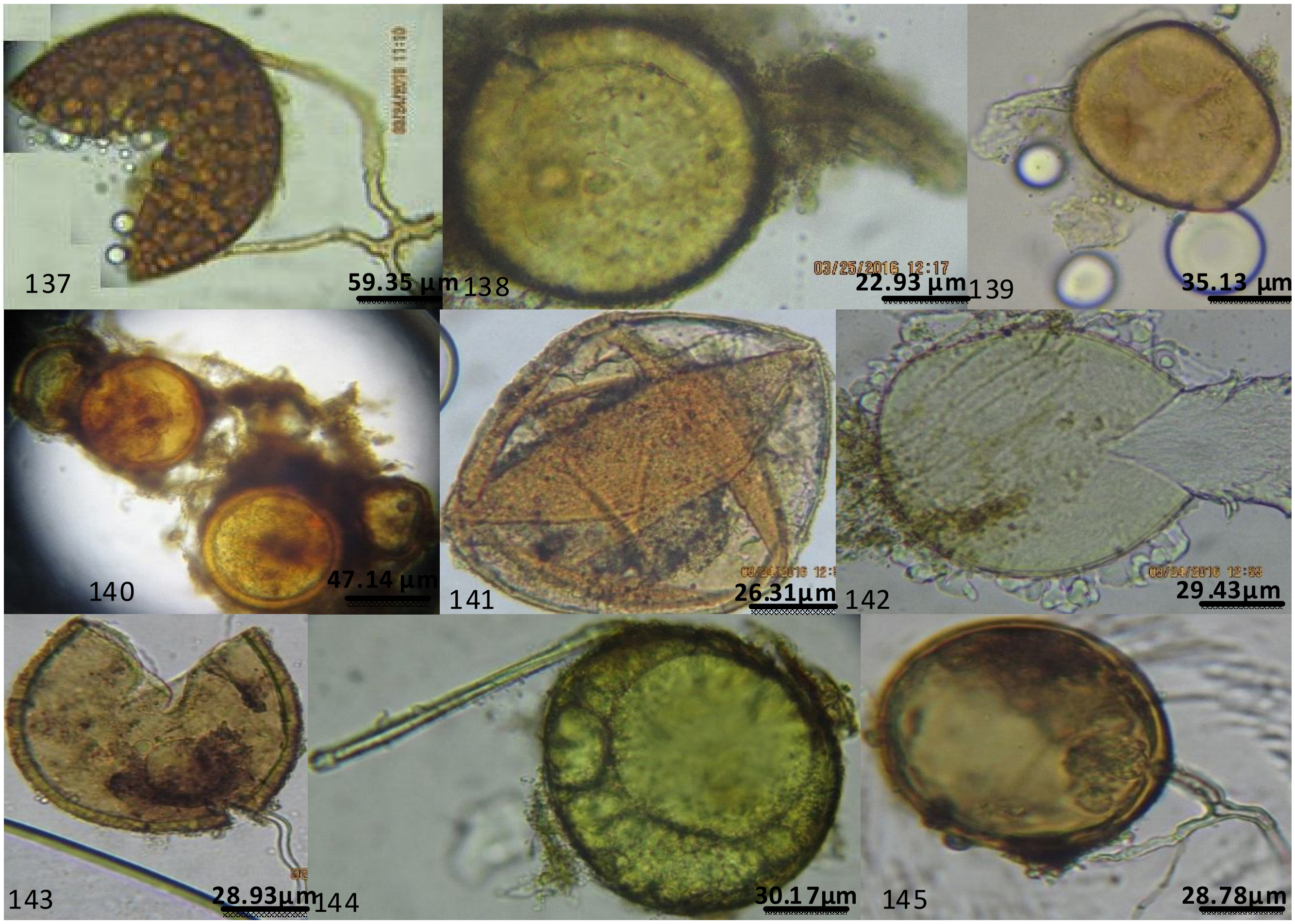


Fig. 8: Endomycorrhizal fungi isolated from the rhizosphere of mycorrhizal leek plants.

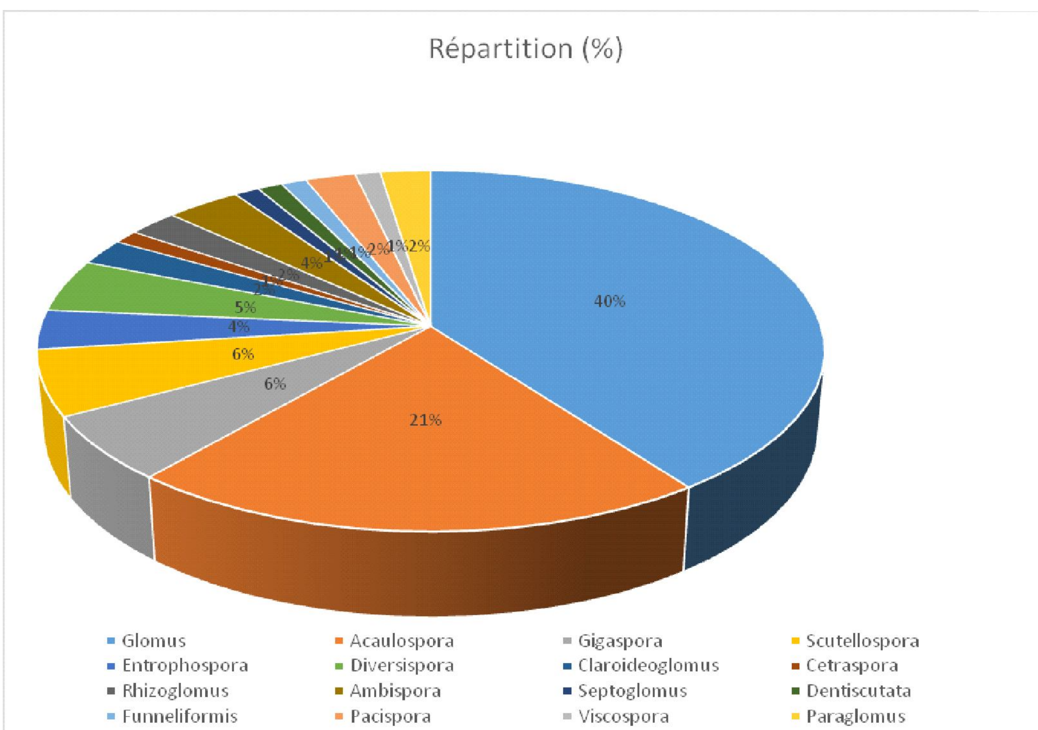


Fig. 9: The distribution of the isolated genera of the leek rhizosphere.

Table 1: Different morphological characters of endomycorrhizal fungi spores that were isolated from the rhizosphere of leek plants.

Number	Spore name	Spore form	Spore color	Spore size	Wall size	Length of the hypha	Spore surface
1	*Acaulospora denticulata*	Globular	Yellow	99	1	-	Granular
2	*Glomus intraradices*	subglobular	Light yellow	105.66	1	-	Smooth
3	*Claroideoglomus claroideum*	Globular	Yellow green	85	1,5	-	Smooth
4	*Claroideoglomus etunicatum*	Oval	beige	99	3	2	Granular
5	*Glomus intraradices*	Globular	Yellow	92.4	2	-	Smooth
6	*Glomus tortuosum*	Subglobular	Yellow	132	1	40	Smooth
7	*Gigaspora candida*	Globular	Dark yellow	131	1	40	Granular
8	*Acaulospora delicata*	Subglobular	Yellow	125.4	3	-	Granular
9	*Glomus intraradices*	Oval	Yellow	115.5	1	-	Granular
10	*Rhizoglomus microaggregatum*	Subglobular	Dark yellow	145.2	2	-	Granular
11	*Glomus minutum*	Globular	White green	99	1	-	Smooth
12	*Glomus luteum*	Globular	Yellow green	89.1	3	12	Granular
13	*Glomus intraradices*	Globular	Yellow	132	1	-	Smooth
14	*Glomus glomerulatum*	Subglobular	Dark yellow	92.4	1	-	Granular
15	*Glomus intraradices*	Subglobular	orange	303.6	4	-	Smooth
16	*Scutellospora calospora*	Globular	Light yellow	99	1	30	Granular
17	*Acaulospora mellea*	Subglobular	Dark green	112.2	1	-	Granular
18	*Acaulospora trappei*	Oval	Light brown	171.6	2	-	Smooth
19	*Glomus rubiforme*	Subglobular	Dark yellow	85.8	3	-	Smooth
20	*Acaulospora sp1*	Globular	Yellow green	99	1	-	Granular
21	*Glomus etunicatum*	Globular	Dark orange	85.8	2	-	Granular
22	*Rhizoglomus fasciculatum*	Globular	Dark orange	155.1	3	-	Smooth
23	*Glomus etunicatum*	Globular	Dark yellow	250.47	4	-	Smooth
24	*Glomus macrocarpum*	Subglobular	Brown	99	2	10	Granular
25	*Glomus aggregatum*	Subglobular	Yellow	99	-	-	Granular
26	*Glomus deserticola*	Globular	orange	122.1	1	-	Smooth
27	*Acaulospora foveata*	Subglobular	Lightorange	115.5	1	-	Granular
28	*Glomus entunicatum*	Globular	Dark yellow	99	4	-	Smooth
29	*Glomus microcarpum*	Globular	Brown	95.7	1	30	Granular
30	*Acaulospora colossica*	Globular	Brown	297	-	-	Granular
31	*Scutellospora biornata*	Globular	Brown	82.5	1	16	Granular
32	*Entrophospora infrequens*	Subglobular	Brown	112.2	1	-	Granular
33	*Glomus pansihalos*	Oval	Orange	132	2	120	Smooth
34	*Glomus multicaule*	Subglobular	Yellow brown	132	3	-	Granular
35	*Septglomus constrictum*	Subglobular	Brown	198	3	30	Smooth
36	*Entrophospora kentinensis*	Subglobular	Yellow green	99	1	-	Granular
37	*Acaulospora scrobiculata*	Globular	Yellow	99	1	12	Granular
38	*Glomus pansihalos*	Subglobular	Light brown	72.6	1	15	Smooth
39	*Glomus aureum*	Subglobular	Orange	66	1	25	Granular
40	*Paraglomus laccatum*	Globular	Yellow	99	2	60	Granular
41	*Glomus intraradices*	Globular	Yellow	105.6	2	-	Smooth
42	*Acaulospora gerdemannii*	Globular	Yellow	118.8	2	-	Granular
43	*Glomus macrocarpum*	Globular	Dark yellow	132	2	-	Smooth
44	*Acaulospora scrobiculata*	Globular	Dark yellow	118.8	3	-	Granular
45	*Acaulospora gerdemannii*	Globular	Yellow	105.6	3	-	Granular
46	*Acaulospora foveata*	Subglobular	Yellow	148.5	3	-	Granular
47	*Dentiscutata heterogama*	Globular	Yellow	132	3	-	Granular
48	*Funneliformis geosporum*	Gobular	Dark yellow	141.9	4	-	Granular

Table 1 contd.....

Table 1 contd.....

Number	Spore name	Spore form	Spore color	Spore size	Wall size	Length of the hypha	Spore surface
49	*Glomus hoi*	Globular	Yellow	145.2	3	-	Granular
50	*Dentiscutata heterogama*	Globular	Yellow	99	3	-	Granular
51	*Glomus occultum*	Globular	Yellow	82.5	1	50	Smooth
52	*Acaulospora scrobiculata*	Globular	Yellow	132	-	2	Granular
53	*Glomus spinuliferum*	Globular	Yellow	66	1,5	-	Granular
54	*Acaulospora scrobiculata*	Globular	Yellow	132	2	-	Granular
55	*Glomus spinuliferum*	Globular	Yellow	92.4	2	-	Granular
56	*Funneliformis geosporum*	Globular	Dark yellow	165	3	-	Granular
57	*Acaulospora denticulata*	Subglobular	Yellow	184.8	2	-	Granular
58	*Glomus clarum*	Globular	Dark yellow	178.2	1	5	Smooth
59	*Acaulospora scrobiculata*	Globular	Yellow	105.6	2	2	Smooth
60	*Glomus intraradices*	Globular	Light yellow	115.5	2	-	Smooth
61	*Glomus monosporum*	globular	Yellow	145.2	2	-	Granular
62	*Scutellospora fulgida*	Ellipsoid	Yellow	99	2	11	Smooth
63	*Glomus perpusillum*	Globular	Yellow	82.5	3	2	Smooth
64	*Glomus intraradices*	Ellipsoid	Yellow	132	1	-	Granular
65	*Glomus arborense*	Globular	Beige	112.2	2	-	Granular
66	*Glomus aureum*	Globular	Yellow	118.8	3	-	Smooth
67	*Glomus clarum*	Globular	Dark yellow	102.3	2	-	Smooth
68	*Pacispora franciscana*	Ellipsoid	Yellow	148.5	2	-	Smooth
69	*Diversispora epigaea*	Globular	Light yellow	99	1	-	Smooth
70	*Glomus leptotichum*	Globular	Yellow	95.7	1	-	Smooth
71	*Glomus pansihalos*	Globular	Yellow	79.2	1	6	Smooth
72	*Acaulospora colliculosa*	Subglobular	Light yellow	214.5	1	-	Granular
73	*Glomus perpusillum*	Globular	Yellow	82.5	3	4	Smooth
74	*Pacispora sp*	Subglobular	Yellow	155.1	1	-	Granular
75	*Acaulospora rehmii*	Globular	Dark yellow	105.6	1	20	Granular
76	*Glomus fasciculatum*	Subglobular	Dark yellow	92.4	2	-	Granular
77	*Glomus microcarpum*	Globular	Dark yellow	112.2	2	-	Smooth
78	*Ambispora sp*	Ellipsoid	Yellow	115.5	1	-	Granular
79	*Glomus macrocarpum*	Globular	Dark yellow	108.9	3	-	Smooth
80	*Viscospora viscosa*	Subglobular	Yellow	112.2	2	-	Smooth
81	*Glomus fasciculatum*	Subglobular	Dark yellow	85.8	3	-	Granular
82	*Glomus fecundisporum*	Globular	Brown	99	2	12	Granular
83	*Glomus mosseae*	Globular	Dark yellow	99	2	-	Granular
84	*Glomus fecundisporum*	Subglobular	Yellow	115	2	-	Granular
85	*Glomus diaphanum*	Subglobular	Yellow	99	2	90	Granular
86	*Acaulospora colliculosa*	Ellipsoid	Light yellow	132	1	20	Granular
87	*Acaulospora sp2*	Globular	Yellow green	75.9	2	5	Granular
88	*Acaulospora capsicula*	Subglobular	Yellow	72.6	1	6	Granular
89	*Acaulospora longula*	Subglobular	Yellow	174.9	3	-	Granular
90	*Glomus aggregatum*	Subglobular	Brown	118.8	3	30	Smooth
91	*Glomus aggregatum*	Globular	Lightorange	56.1	2	10	Smooth
92	*Glomus intraradices*	Subglobular	Dark yellow	75.9	1	12	Granular
93	*Glomus formosanum*	Globular	Yellow orange	79.2	2	20	Granular
94	*Gigaspora sp1*	Subglobular	Lightgreen	115.5	-	-	Granular
95	*Acaulospora sp3*	Globular	Brown	132	3	-	Granular
96	*Acaulospora pustulata*	Globular	Brown	85.8	1	20	Granular

Table 1 contd.....

Table 1 contd.....

Number	Spore name	Spore form	Spore color	Spore size	Wall size	Length of the hypha	Spore surface
97	*Acaulospora rehmii*	Subglobular	Orange	105.6	1	-	Granular
98	*Cetraspora helvetica*	Subglobular	Yellow green	72.6	3.5	2	Granular
99	*Glomus entunicatum*	Subglobular	Yellowbrown	79.2	-	-	Granular
100	*Glomus entunicatum*	Subglobular	Brown	66	1	3	Granular
101	*Scutellospora savannicola*	Ellipsoid	Dark yellow	145.2	1	5	Granular
102	*Glomus intraradices*	Globular	Light yellow	138.6	2	22	Granular
103	*Glomus clarum*	Globular	Light yellow	69.3	2	-	Granular
104	*Diversispora omaniana*	Globular	Light yellow	115.5	1	-	Granular
105	*Glomus clarum*	Globular	Dark yellow	99	2	-	Granular
106	*Glomus versiforme*	Globular	Yellow	99	1.5	-	Granular
107	*Glomus intraradices*	Subglobular	Dark yellow	82.5	1	-	Granular
108	*Glomus mosseae*	Subglobular	Dark yellow	112.2	2	-	Granular
109	*Diversispora celata*	oval	Yellow	171.6	1	50	Granular
110	*Acaulospora laevis*	Ellipsoid	Yellow green	99	1	20	Granular
111	*Acaulospora rehmii*	Globular	Dark yellow	99	2	2	Granular
112	*Claroideoglomus etunicatum*	Globular	Orange	118.8	4	-	Granular
113	*Glomus intraradices*	Globular	Yellow green	85.8	1	20	Granular
114	*Glomus clarum*	Globular	Dark yellow	89.1	1	-	Granular
115	*Diversispora sp*	Ellipsoid	Light yellow	115.5	3	-	Smooth
116	*Glomus intraradices*	Globular	Yellow orange	99	2	-	Granular
117	*Glomus clarum*	Subglobular	Orange	122.1	2	-	Granular
118	*Claroideoglomus etunicatum*	Globular	orange	99	2	3	Granular
119	*Glomus clarum*	Globular	Yellow	125.4	4	2	Granular
120	*Gigaspora margarita*	Globular	Dark yellow	92.4	1	20	Granular
121	*Glomus mosseae*	Ellipsoid	Yellow	132	1	-	Granular
122	*Gigaspora margarita*	Globular	Dark yellow	112.2	1,5	5	Granular
123	*Glomus mosseae*	Oval	Yellow	194.7	1	-	Granular
124	*Paraglomus majewskii*	Oval	Yellow green	105.6	3	-	Granular
125	*Glomus intraradices*	Globular	Brown	165	1	40	Granular
126	*Glomus intraradices*	Globular	Dark yellow	92.4	1	22	Granular
127	*Glomus arenarium*	Ellipsoid	Dark yellow	171.6	2	20	Granular
128	*Scutellospora spinosissima*	Oval	Yellow	198	1	20	Granular
129	*Gigaspora sp2*	Ellipsoid	Light yellow	92.4	2	-	Granular
130	*Entrophospora nevadensis*	Globular	Brown	99	2	-	Granular
131	*Acaulospora sp4*	Globular	Yellow	132	1	20	Granular
132	*Glomus claroideum*	Subglobular	Yellow	108.9	2	12	Smooth
133	*Acaulospora scrobiculata*	Globular	Yellow	115.5	2	7	Granular
134	*Ambispora leptoticha*	Subglobular	Yellow	132	2	-	Smooth
135	*Gigaspora decipiens*	Subglobular	Gray	99	1	-	Granular
136	*Glomus macrocarpum*	Globular	Yellow	85.8	2	-	Granular
137	*Glomus versiforme*	Globular	Dark orange	165	1	150	Granular
138	*Glomus clarum*	Globular	Yellow	92.4	1	16	Granular
139	*Glomus aureum*	Subglobular	Orange	92.4	1	16	Smooth
140	*Glomus macrocarpum*	Globular	Yellow	85.8	2	-	Granular
141	*Glomus radiatus*	Ellipsoid	orange	122.1	-	-	Granular
142	*Ambispora brasiliensis*	Subglobular	Light yellow	92.4	1	-	Granular
143	*Glomus muliticulae*	Globular	Yellow	105.6	2	30	Granular
144	*Glomus fragilistratum*	Globular	Yellow	108.9	1	36	Granular
145	*Glomus boreale*	Globular	Yellow	99	2	35	Smooth

capsicula, Acaulospora longula, Glomus formosanum, Gigaspora sp.1, *Acaulospora* sp.3, *Acaulospora pustulata, Cetraspora helvetica, Scutellospora savannicola, Diversispora celata, Acaulospora laevis, Diversispora omaniana, Dentiscutata heterogama, Diversispora* sp, *Gigaspora margarita, Paraglomus majewskii, Glomus arenarium, Scutellospora spinosissima, Gigaspora* sp.2, *Entrophospora nevadensis, Acaulospora* sp.4, *Glomus claroideum, Ambispora leptoticha, Gigaspora decipiens, Glomus radiatus, Ambispora brasiliensis, Glomus muliticulae, Glomus fragilistratum, Glomus boreale, Rhizoglomus microaggregatum)* and the non-sporulation of 18 species (*Glomus proliferum, Glomus constrictum, Glomus geosporum Glomus* sp.1 *Glomus* sp.2, *Glomus* sp.3, *Glomus* sp.4, *Glomus* sp.5, *Acaulospora spinosa, Acaulospora* sp.1, *Acaulospora* sp.2, *Acaulospora* sp.3, *Acaulospora* sp.4, *Entrophospora* sp.1, *Gigaspora* sp.1, *Gigaspora* sp.2, *Gigaspora* sp.3, *Scutellospora* sp.1).

In addition, a comparison of different species of AM fungi from the original inoculum (Chliyeh *et al.,* 2016) with those isolated from the rhizosphere of leek plants after 30 months of inoculation recorded the appearance of 69 species (*Claroideoglomus etunicatum, Claroideoglomus claroideum, Glomus minutum, Glomus glomerulatum, Acaulospora delicata, Scutellospora calospora, Gigaspora candida, Glomus tortuosum, Glomus luteum, Acaulospora scrobiculata, Acaulospora mellea, Acaulospora trappei, Glomus rubiforme, Acaulospora* sp.1, *Rhizoglomus fasciculatum, Glomus deserticola, Acaulospora colossica, Scutellospora biornata, Entrophospora infrequens, Septglomus constrictum, Glomus aureum, Paraglomus laccatum, Acaulospora gerdemannii, Glomus spinuliferum, Funneliformis geosporum, Entrophospora kentinensis, Glomus hoi, Glomus occultum, Glomus monosporum, Scutellospora fulgida, Glomus perpusillum, Glomus arborense, Pacispora franciscana, Diversispora epigaea, Glomus leptotichum, Acaulospora colliculosa, Acaulospora rehmii, Pacispora* sp, *Glomus microcarpum, Ambispora* sp, *Viscospora viscosa, Glomus fecundisporum, Acaulospora* sp.2, *Acaulospora capsicula, Acaulospora longula, Glomus formosanum, Gigaspora* sp.1, *Acaulospora* sp.3, *Acaulospora pustulata, Cetraspora helvetica, Scutellospora savannicola, Diversispora celata, Acaulospora laevis, Diversispora omaniana, Dentiscutata heterogama, Diversispora* sp, *Paraglomus majewskii, Glomus arenarium, Scutellospora spinosissima, Gigaspora* sp.2, *Entrophospora nevadensis, Acaulospora* sp.4, *Ambispora leptoticha, Gigaspora decipiens, Glomus radiatus, Ambispora brasiliensis, Glomus muliticulae, Glomusfragilistratum, Rhizoglomus microaggregatum*) and the disappearance of 6 species (*Acaulospora bireticulata, Acaulospora spinosa, Entrophospora colombiana, Glomus spurucum, Glomus trimurales, Scutellospora nigra*).

In this study, the enumeration of endomycorrhizal fungi spores showed a predominance of *Glomus intraradices, Glomus clarum* and *Acaulospora scrobiculata,* belonging to the genera *Glomus* and *Acaulospor*a. These results corroborate those obtained by Sghir *et al*., (2014) who reported the predominance of *Glomus clarum* in the rhizosphere of the date palm, and those obtained by Talbi *et al*., (2016) who noted the dominance of the same species in the rhizosphere of carroubier.

Thus, these genera have already been observed in many areas such as: The Sudanese region of Burkina Faso, the rhizosphere of Acacia holosericea and A. mangium (Bâ *et al.,* 1996), the Moroccan coastal dunes of Souss Massa (Hatim and Tahrouch, 2007), the rhizosphere of *Eryngium maritimum*, the mobile dunes of Mehdia in Morocco (Hibilik *et al.,* 2016), and in the rhizosphere of Casuarina sp. in Morocco (Tellal *et al.,* 2008).

In addition, the abundance of the genus *Glomus* has also been found in the citrus rhizosphere (Artib *et al.,* 2016, Wang, 2012), in the olive rhizosphere (Chliyeh *et al.,* 2014; Kachkouch *et al.*., 2014), in Oleaster (Sghir *et al.,* 2013), date palm (Sghir *et al.,* 2014), argan (Sellal *et al.,* 2016), in plant species of the Brazilian Atlantic forest (Souchie *et al.,* 2006) and in other tropical regions such as Senegal (Diop *et al.,* 1994). Generally, the genus *Glomus* is the most represented in terms of species in the semi-arid ecosystems soils, probably because of its ability to adapt to degraded soils (Ba *et al.,* 1996).

According to Turrini *et al.,* (2008), the diversity of other representatives' fungi of the arbuscular mycorrhizal fungi genera in ecosystems is lower than those belonging to the genus Glomus. This can be explained by the ability of this genus species to quickly initiate the colonization process of various plant species roots from infected root spores and hyphae. In contrast, the representatives of genera Gigaspora and Scutellospora are not able to initiate new root infections only from spores (Biermann and Linderman, 1983).

In MA fungi, there is no specificity between the host plant and the fungal partner (Mosse *et al.,* 1981). An endomycorrhizal fungus can be associated with several plants and the same plant can be infected by several species of CMA. For example, Glomus mosseae has been shown to colonize the roots of twenty different plant species belonging to twelve families (Mosse, 1973). However, there is an increasing evidence that AMF fungus species differ in their ability to proliferate in the rhizospheres of different crops (Schenck and Kinlock, 1980; McGraw and Hendrix, 1984; Johnson *et al.,* 1991).

Koske and Walker, (1985) noted that the presence of the genus *Scutellospora* species is constantly related to soil pH and organic matter (carbon and nitrogen). High densities of *Acaulospora* spores have been reported in acidic environments (Morton 1986, Porter *et al.,* 1987) suggesting that members of this genus tend to be well adapted to soils with acidic pH. Thus, it was noted that the spores of the genus Gigasporagerminate better at acidic pH, while those of the genus *Glomus* preferred pH around neutrality (Daniels and Trappe 1980; Hepper 1984).

Other studies have shown that there is no correlation between the number of spores and the intensity of root infection (Mukerji and Kapoor 1986; Clapp *et al.,* 1995; Merry weather and Fitter, 1998). This correlation between the spore population and root infection is positive under often-controlled conditions (Jensen and Jakobsen, 1980). The weak relationship between endomycorrhizal formation and spore density may be due to non-viability, spore dormancy (Jasper *et al.,* 1991), and discontinuous sporulation of some Glomeromycota members (Schûbler *et al.,* 2001).

This result confirms that MA fungi are not very specific against the host plants that they colonize with stimulating effects of the growth of their hosts (Hart *et al.,* 2003). It has been previously shown that when MA plant and fungi are cultured, the growth and composition of fungal communities will strongly depend on host plants (Douds and Miller 1999, Kiers *et al.,* 2000). On the other hand, some fungal species may be more beneficial to one plant than others (van der Heijden *et al.,* 1998a).

There is great interest in studying and using CMAs in agriculture as biofertilizers (Sadhana, 2014). Their large-scale application reduces the use and dependence of chemical fertilizers. This is a consequence of the improvement in the amount of soil mineral elements assimilated by mycorrhizal plants, leading to increased plant growth (Abbott and Robson, 1991).

These results show that when a composite endomycorrhizal inoculum is inoculated with a given plant species, some species of this inoculum sporulate and stabilize over time in the rhizosphere of this species. On the other hand, others develop and form only mycelial filaments, but can sporulate when confronted with another plant species. Indeed, when the leek plants are inoculated with arbuscular mycorrhizal fungi inoculum, originating from the rhizosphere of the olive tree, certain species that did not sporulate in the olive rhizosphere of the plants sporulated at the level of those of the leek seedlings.

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