A. Rambelli, S. Tempesta & B. Mulas

Fungi of Mediterranean ecosystems

Abstract

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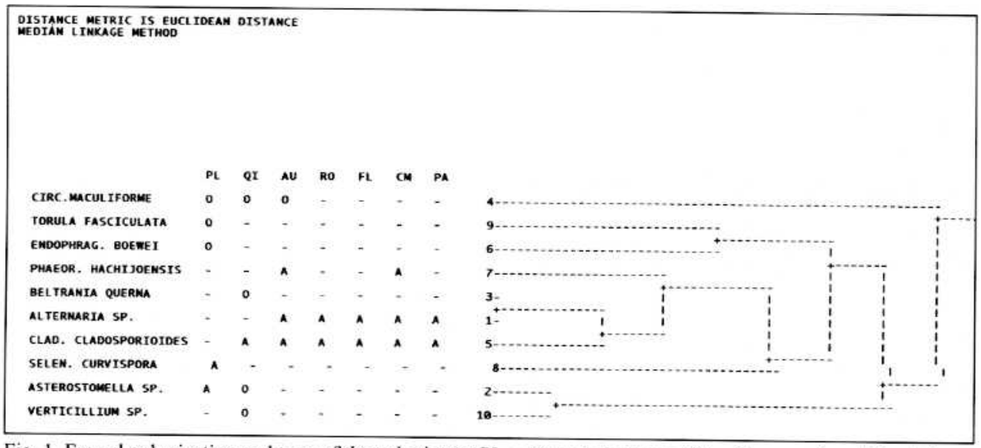
The Authors examine the importance of fungi in the decomposition of vegetal organic matter and propose ti study the phenomenon through the determination of the colony optimal or adaptive consistence. With researches carried out in mediterranean maquis areas different conditions selectioning fungal communities were investigated, among these matrices and areas considered as principal cause of a saprotrophic specialisation among fungi and plants.

Introduction

The ecology of litter fungi is a subject very studied by different researchers, mainly with the purpose to identify the composition of the different fungal communities; only little was done to study the importance of the different fungal species as colonizers of different vegetal residuals (Bills & Polishook 1994; Ciccarone & Rambelli 1998, 2000; Laessoe & Lodge 1994; Lodge 1997; Lodge & Cantrell 1994; Lodge & Laessoe 1995; Mulas & Rambelli 1995; Mulas & al. 1995; Pasqualetti & al. 1995; Pasqualetti & al. 1999; Polishook & al. 1996). Only recently the analysis of microfungi of different species of plant litters was extended to the evaluation of two parameters: number of colonies for unit of surface and type of colonies, this last parameter defined as optimal or adaptive (Pasqualetti & al. 1995). If we consider the colonization only as number of colonies we attribute the same importance to a colony with a regular development and to a colony with development suffered and if the species or the matrices are different we lose the possibilities to evaluate the importance of the different colonizations. Through the analysis of these parameters is possible to understand the definition of saprotrofic specialization. Obviously, the finding of a species on a matrix with optimal development does not exclude its presence on another with a better development: the subject is more and more open to new investigations.

From these considerations are arising interesting possibilities of researches on matrices of different ecosystems: evaluating the type of colonization we can understand the role of the single fungal species and indirectly their importance in mineralization processes (Pasqualetti & al. 1995; Rambelli 1991, 2000).

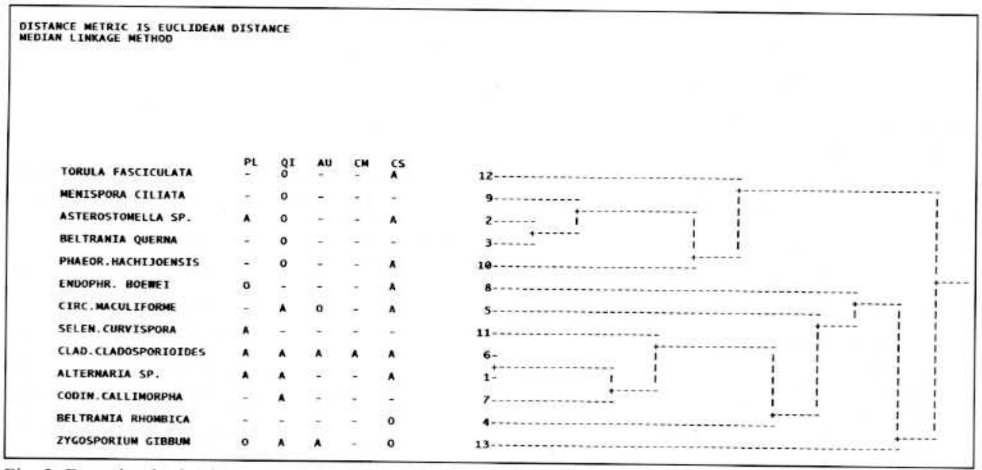
Thirteen sardinian mediterranean maquis areas were investigated with the purpose to single out the fungal communities colonizing the litter leaves of the different plants and to



DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

	PL	QI	AU	RO	FL	CM	PA
CIRC.MACULIFORME	O	O	O	-	-	-	-
TORULA FASCICULATA	O	-	-	-	-	-	-
ENDOPHRAG. BOEWEI	O	-	-	-	-	-	-
PHAEOR. HACHIJOENSIS	-	-	A	-	-	A	-
BELTRANIA QUERNA	-	O	-	-	-	-	-
ALTERNARIA SP.	-	-	A	A	A	A	A
CLAD. CLADOSPORIOIDES	-	A	A	A	A	A	A
SELEN. CURVISPORA	A	-	-	-	-	-	-
ASTEROSTOMELLA SP.	A	O	-	-	-	-	-
VERTICILLIUM SP.	-	O	-	-	-	-	-

Fig. 1. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, QI = *Quercus ilex*, AU = *Arbutus unedo*, RO = *Rosmarinus officinalis*, FL = *Phillyrea latifolia*, CM = *Cistus monspeliensis*, PA = *Phillyrea angustifolia* at Ingurtosu.



DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

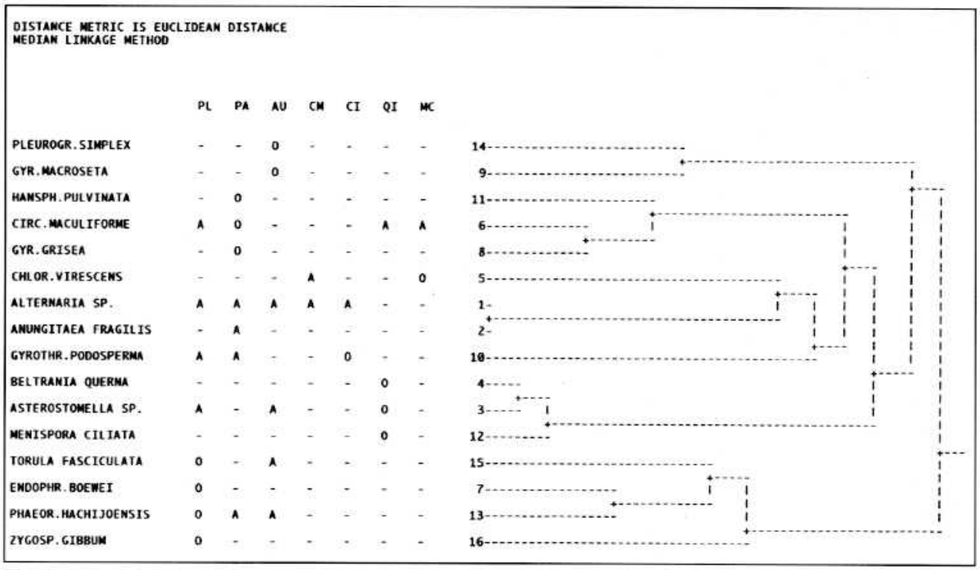
	PL	QI	AU	CM	CS
TORULA FASCICULATA	-	O	-	-	A
MENISPORA CILIATA	-	O	-	-	-
ASTEROSTOMELLA SP.	A	O	-	-	A
BELTRANIA QUERNA	-	O	-	-	-
PHAEOR.HACHIJOENSIS	-	O	-	-	A
ENDOPHR. BOEWEI	O	-	-	-	A
CIRC.MACULIFORME	-	A	O	-	A
SELEN.CURVISPORA	A	-	-	-	-
CLAD.CLADOSPORIOIDES	A	A	A	A	A
ALTERNARIA SP.	A	A	-	-	A
CODIN.CALLIMORPHA	-	A	-	-	-
BELTRANIA RHOMBICA	-	-	-	-	O
ZYGOSPORIUM GIBBUM	O	A	A	-	O

Fig. 2. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, QI = *Quercus ilex*, AU = *Arbutus unedo*, CM = *Cistus monspeliensis*, CS = *Cistus salvifolius* at Caprera.

determine their importance estimating the type of the colonies, optimals or adaptives. It is necessary to point out that these areas are characterized by little different environmental conditions, like exposition to the winds, to small different local temperatures, ecc., up to determine the presence or not of some plants species and the presence or not of some fungal species. Again, in some areas the vegetation is suffering for environmental impacts determined by swimming with related conseguences.

The data, obtained by direct observation of the matrices, were elaborated by cluster analysis after determination of the type of colonization.

As we will see from the figures the majority of the fungal species colonize the dead leaves of *Pistacia lentiscus* as optimal and adaptive types. Nevertheless in several plant



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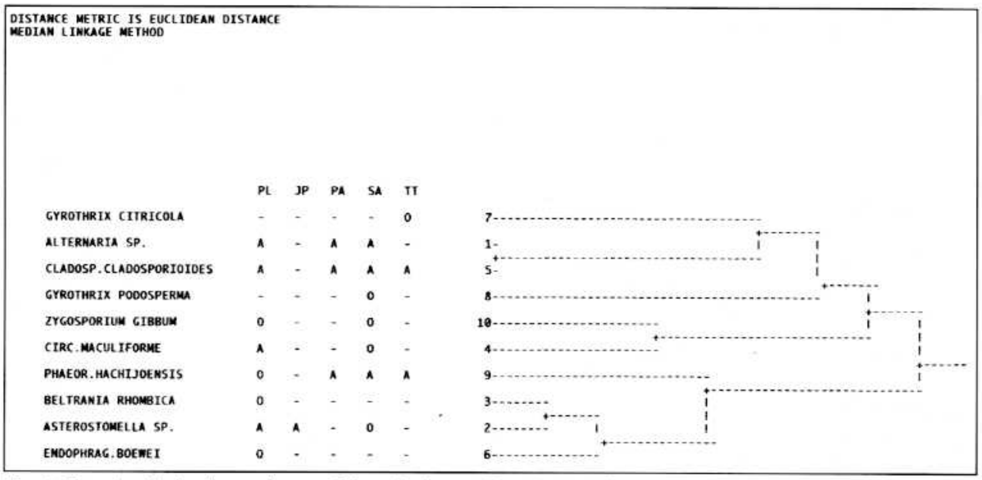
DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                        PL  PA  AU  CM  CI  QI  MC

PLEUROGR.SIMPLEX        -   -   0   -   -   -   -     14
GYR.MACROSETA           -   -   0   -   -   -   -      9
HANSPH.PULVINATA        -   0   -   -   -   -   -     11
CIRC.MACULIFORME        A   0   -   -   -   A   A      6
GYR.GRISEA              -   0   -   -   -   -   -      8
CHLOR.VIRESCENS         -   -   -   A   -   -   0      5
ALTERNARIA SP.          A   A   A   A   A   -   -      1
ANUNGITAEA FRAGILIS     -   A   -   -   -   -   -      2
GYROTHR.PODOSPERMA      A   A   -   -   0   -   -     10
BELTRANIA QUERNA        -   -   -   -   -   0   -      4
ASTEROSTOMELLA SP.      A   -   A   -   -   0   -      3
MENISPORA CILIATA       -   -   -   -   -   0   -     12
TORULA FASCICULATA      0   -   A   -   -   -   -     15
ENDOPHR.BOEWEI          0   -   -   -   -   -   -      7
PHAEOR.HACHIJOENSIS     0   A   A   -   -   -   -     13
ZYGOSP.GIBBUM           0   -   -   -   -   -   -     16
```

Fig. 3. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, PA = *Phillirea angustifolia*, AU = *Arbutus unedo*, CM = *Cistus monspeliensis*, CI = *Cistus incanus*, QI = *Quercu ilex*, MC = *Mirtus communis* at Gonnesa.



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DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                              PL  JP  PA  SA  TT

GYROTHRIX CITRICOLA           -   -   -   -   0      7
ALTERNARIA SP.                A   -   A   A   -      1
CLADOSP.CLADOSPORIOIDES       A   -   A   A   A      5
GYROTHRIX PODOSPERMA          -   -   -   0   -      8
ZYGOSPORIUM GIBBUM            0   -   -   0   -     10
CIRC.MACULIFORME              A   -   -   0   -      4
PHAEOR.HACHIJOENSIS           0   -   A   A   A      9
BELTRANIA RHOMBICA            0   -   -   -   -      3
ASTEROSTOMELLA SP.            A   A   -   0   -      2
ENDOPHRAG.BOEWEI              0   -   -   -   -      6
```
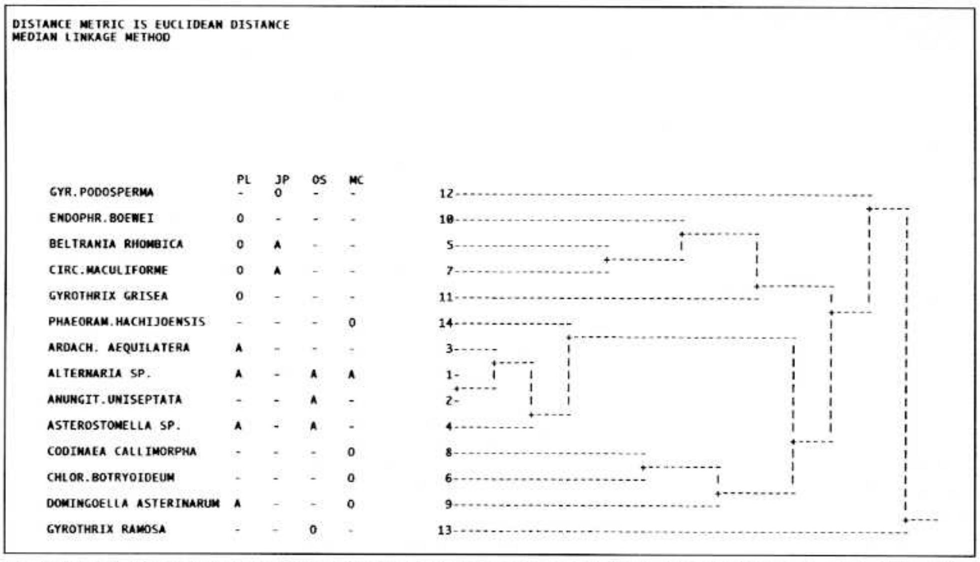

Fig. 4. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, QI = *Quercus ilex*, AU = *Arbutus unedo*, RO = *Rosmarinus officinalis*, FL = *Phillyrea latifolia*, CM = *Cistus monspeliensis*, PA = *Phillyrea angustifolia* at Ingurtosu.

species a small group of fungal species is present and they seem characteristic and bounded to the chemical and physical composition of the matrice: on the dead leaves of *P. lentiscus* is always present *Endophragmiella boewei* and very frequently *Phaeoramularia hachijoensis, Asterostomella* sp., *Gyrothrix grisea, Zygosporium gibbum, Torula fasciculata* and *Beltrania rhombica* (Figs 1-13).

Considering adaptive and optimal colonizations we find that some of these species can't



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DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                              PL   JP   OS   MC
GYR.PODOSPERMA                -    0    -    -        12
ENDOPHR.BOEWEI                0    -    -    -        10
BELTRANIA RHOMBICA            0    A    -    -         5
CIRC.MACULIFORME              0    A    -    -         7
GYROTHRIX GRISEA              0    -    -    -        11
PHAEORAM.HACHIJOENSIS         -    -    -    0        14
ARDACH. AEQUILATERA           A    -    -    -         3
ALTERNARIA SP.                A    -    A    A         1
ANUNGIT.UNISEPTATA            -    -    A    -         2
ASTEROSTOMELLA SP.            A    -    A    -         4
CODINAEA CALLIMORPHA          -    -    -    0         8
CHLOR.BOTRYOIDEUM             -    -    -    0         6
DOMINGOELLA ASTERINARUM       A    -    -    0         9
GYROTHRIX RAMOSA              -    -    0    -        13
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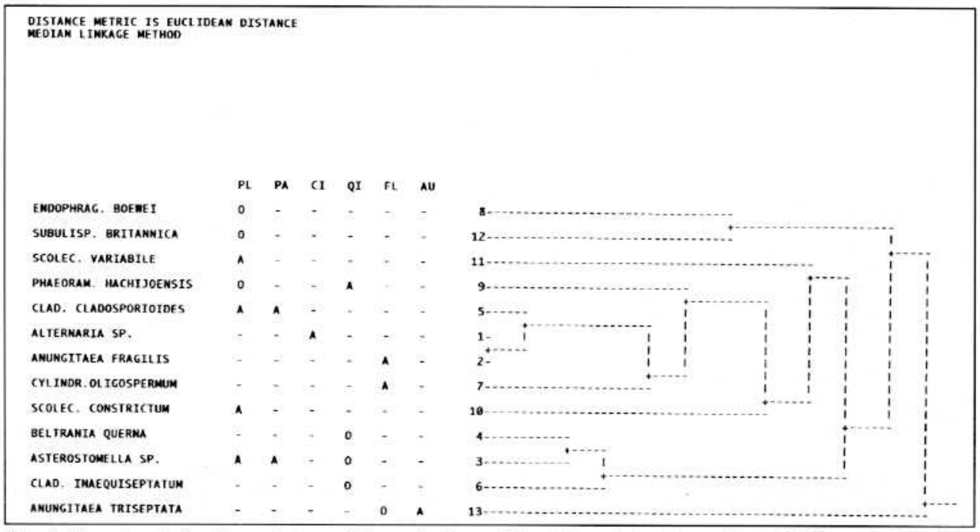
Fig. 5. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, JP = *Juniperus phoenicia*, OS = *Olea sylvestris*, MC = *Myrtus communis* at Santa Caterina.



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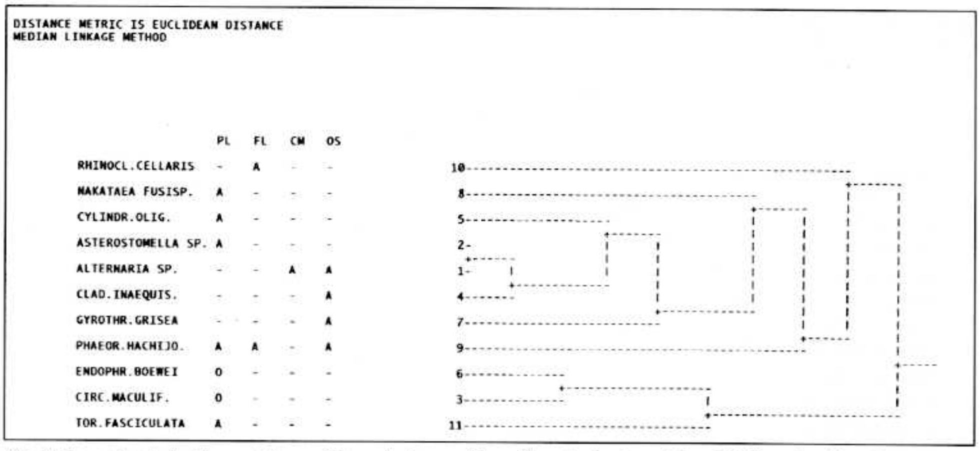
DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                           PL   PA   CI   QI   FL   AU
ENDOPHRAG. BOEWEI          0    -    -    -    -    -      8
SUBULISP. BRITANNICA       0    -    -    -    -    -     12
SCOLEC. VARIABILE          A    -    -    -    -    -     11
PHAEORAM. HACHIJOENSIS     0    -    -    A    -    -      9
CLAD. CLADOSPORIOIDES      A    A    -    -    -    -      5
ALTERNARIA SP.             -    -    A    -    -    -      1
ANUNGITAEA FRAGILIS        -    -    -    -    A    -      2
CYLINDR.OLIGOSPERMUM       -    -    -    -    A    -      7
SCOLEC. CONSTRICTUM        A    -    -    -    -    -     10
BELTRANIA QUERNA           -    -    -    0    -    -      4
ASTEROSTOMELLA SP.         A    A    -    0    -    -      3
CLAD. INAEQUISEPTATUM      -    -    -    0    -    -      6
ANUNGITAEA TRISEPTATA      -    -    -    -    0    A     13
```

Fig. 6. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, PA = *Phillyrea latifolia*, CI = *Cistus incabus*, QI = *Quercus ilex*, FL = *Phillyrea latifolia*, AU = *Arbutus unedo* at Naracauli.

be characterizing the matrix since may be present also on leaves of other matrices, like *Asterostomella* sp., this fungus at Ingurtosu colonize also the leaves of *Quercus ilex* (Fig. 1) and at Capo S.Marco the leaves of *Juniperus phoenicia* (Fig. 9) and other cases could be mentioned. On the other hand we find *Beltrania querna* alwais on the leaves of *Q. ilex* at La Madonnina, Naracauli, Ingurtosu, Gonnesa, and Caprera were *Q. ilex* is present (Figs



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DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                    PL   FL   CM   OS
RHINOCL.CELLARIS    -    A    -    -      10
MAKATAEA FUSISP.    A    -    -    -       8
CYLINDR.OLIG.       A    -    -    -       5
ASTEROSTOMELLA SP.  A    -    -    -       2
ALTERNARIA SP.      -    -    A    A       1
CLAD.INAEQUIS.      -    -    -    A       4
GYROTHR.GRISEA      -    -    -    A       7
PHAEOR.HACHIJO.     A    A    -    A       9
ENDOPHR.BOEWEI      O    -    -    -       6
CIRC.MACULIF.       O    -    -    -       3
TOR.FASCICULATA     A    -    -    -      11
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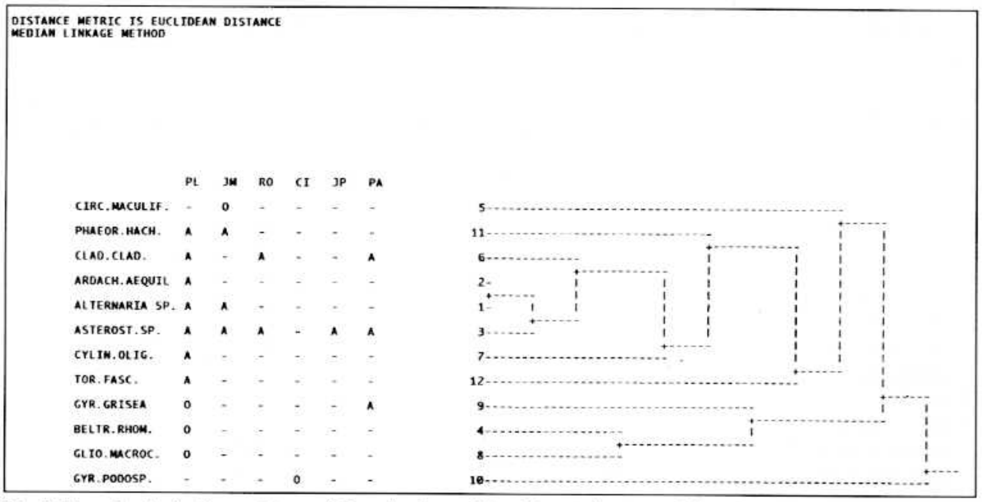
Fig. 7. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, FL = *Phillyrea latifolia*, CM = *Cistus monspeliensis*, OS = *Olea sylvestris* at Buggerru.



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DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                 PL   JM   RO   CI   JP   PA
CIRC.MACULIF.    -    O    -    -    -    -      5
PHAEOR.HACH.     A    A    -    -    -    -     11
CLAD.CLAD.       A    -    A    -    -    A      6
ARDACH.AEQUIL    A    -    -    -    -    -      2
ALTERNARIA SP.   A    A    -    -    -    -      1
ASTEROST.SP.     A    A    A    -    A    A      3
CYLIN.OLIG.      A    -    -    -    -    -      7
TOR.FASC.        A    -    -    -    -    -     12
GYR.GRISEA       O    -    -    -    -    A      9
BELTR.RHOM.      O    -    -    -    -    -      4
GLIO.MACROC.     O    -    -    -    -    -      8
GYR.PODOSP.      -    -    -    O    -    -     10
```
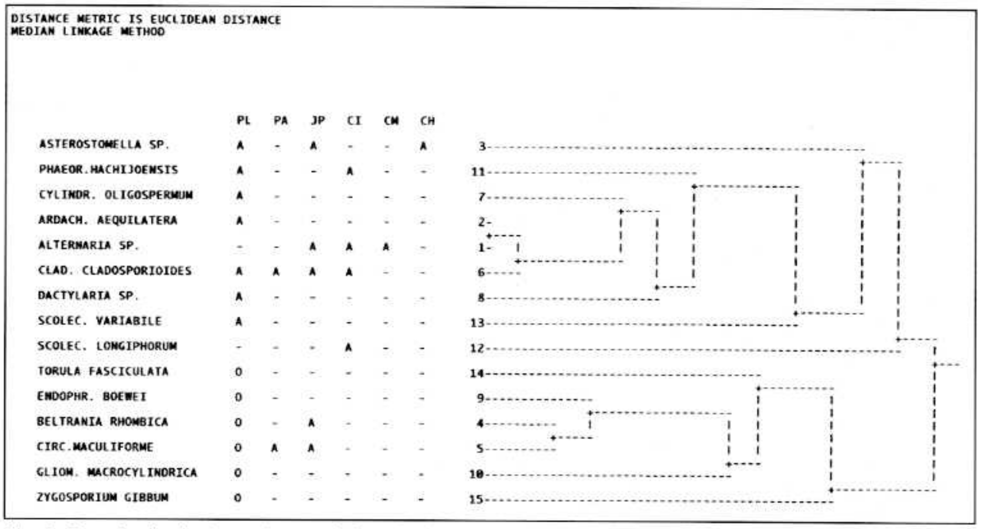

Fig. 8. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, JM = *Juniperus macrocarpa*, RO = *Rosmarinus officinalis*, CI = *Cistus incanus*, JP = *Juniperus phoenicia*, PA = *Phillyrea angustifolia* at Capo Mannu.

2, 3, 6, 13). At Santa Caterina *Myrrus communis* is colonized by *Chloridium botryoideum, Codinaea callimorpha, Phaeoramularia hachijoensis* and *Domingoella asterinarum:* all these species belong to a group of *Dematiaceae* characterized by low pigmentation (Fig. 5). At La Madonnina, Caprera and Gonnesa the dead leaves of Q ilex are colonized by *B. querna* but also present are *Asterostomella* sp. *Torula fasciculata, Menispora ciliata;* at Caprera, area very contaminated during summer time, the colonization is composed also by *Asterostomella* sp., *T. fascicularа, Memnoniella ciliata* and *Rhachijoensis.*

Circinotrichum maculiforme is present on leaves of *Arbutus unedo* at Caprera and Ingurtosu (Figs 1, 2). At Torre del Sevo the colonization of *P. lentiscus* is well evident like that of *Chamaerops humilis,* of *Cistus monspeliensis* and *Rosmarinus officinalis* (Fig. 12).



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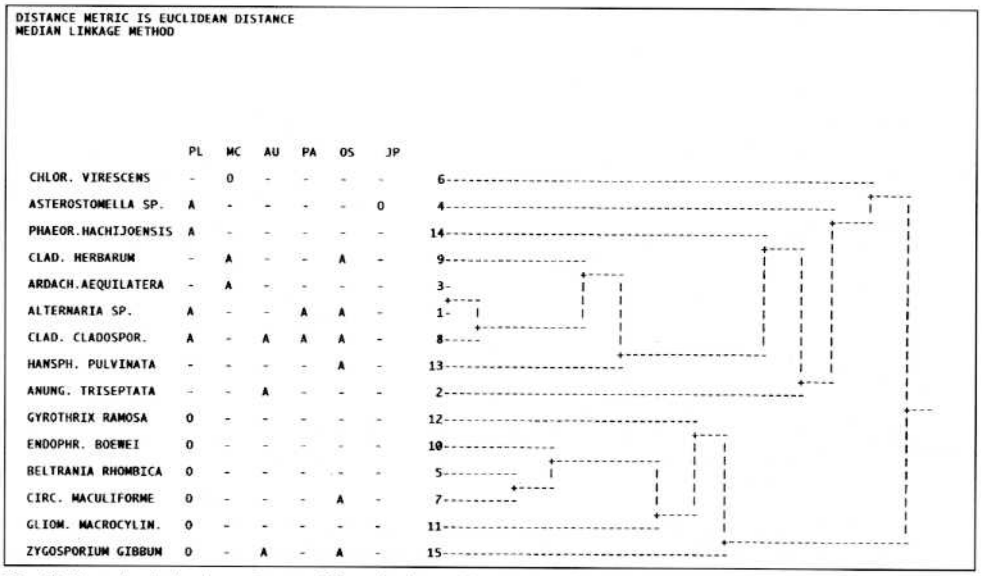
DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                         PL   PA   JP   CI   CM   CH
ASTEROSTOMELLA SP.       A    -    A    -    -    A      3
PHAEOR.HACHIJOENSIS      A    -    -    A    -    -     11
CYLINDR. OLIGOSPERMUM    A    -    -    -    -    -      7
ARDACH. AEQUILATERA      A    -    -    -    -    -      2
ALTERNARIA SP.           -    -    A    A    A    -      1
CLAD. CLADOSPORIOIDES    A    A    A    A    -    -      6
DACTYLARIA SP.           A    -    -    -    -    -      8
SCOLEC. VARIABILE        A    -    -    -    -    -     13
SCOLEC. LONGIPHORUM      -    -    -    A    -    -     12
TORULA FASCICULATA       O    -    -    -    -    -     14
ENDOPHR. BOEWEI          O    -    -    -    -    -      9
BELTRANIA RHOMBICA       O    -    A    -    -    -      4
CIRC.MACULIFORME         O    A    A    -    -    -      5
GLIOM. MACROCYLINDRICA   O    -    -    -    -    -     10
ZYGOSPORIUM GIBBUM       O    -    -    -    -    -     15
```

Fig. 9. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, PA = *Phillyrea angustifolia*, JP = *Juniperus phoenicia*, CI = *Cistus incanus*, CM = *Cistus monspeliensis*, CH = *Chamaerops humilis* at Capo San Marco.



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DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

                     PL   MC   AU   PA   OS    JP
CHLOR. VIRESCENS     -    O    -    -    -     -      6
ASTEROSTOMELLA SP.   A    -    -    -    -     O      4
PHAEOR.HACHIJOENSIS  A    -    -    -    -     -     14
CLAD. HERBARUM       -    A    -    -    A     -      9
ARDACH.AEQUILATERA   -    A    -    -    -     -      3
ALTERNARIA SP.       A    -    -    A    A     -      1
CLAD. CLADOSPOR.     A    -    A    A    A     -      8
HANSPH. PULVINATA    -    -    -    -    A     -     13
ANUNG. TRISEPTATA    -    -    A    -    -     -      2
GYROTHRIX RAMOSA     O    -    -    -    -     -     12
ENDOPHR. BOEWEI      O    -    -    -    -     -     10
BELTRANIA RHOMBICA   O    -    -    -    -     -      5
CIRC. MACULIFORME    O    -    -    -    A     -      7
GLIOM. MACROCYLIN.   O    -    -    -    -     -     11
ZYGOSPORIUM GIBBUM   O    -    A    -    A     -     15
```
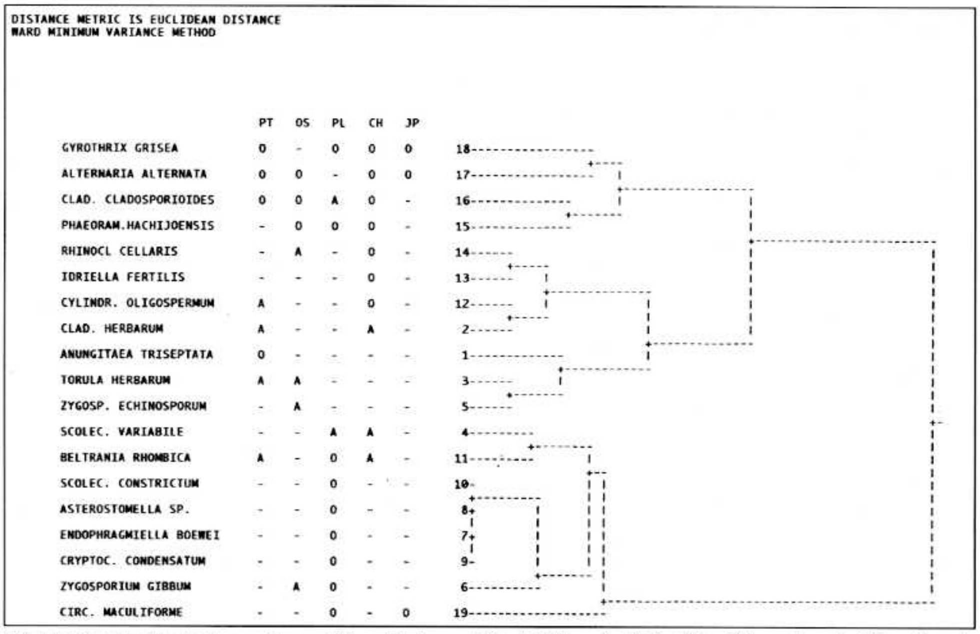

Fig. 10. Fungal colonization and type of the colonies on PL = *Pistacia lentiscus*, MC = *Myrtus communis*, AU = *Arbutus unedo*, PA = *Phillyrea angustifolia*, OS = *Olea sylvestris*, JP = *Juniperus phoenicia* at Santo Stefano.

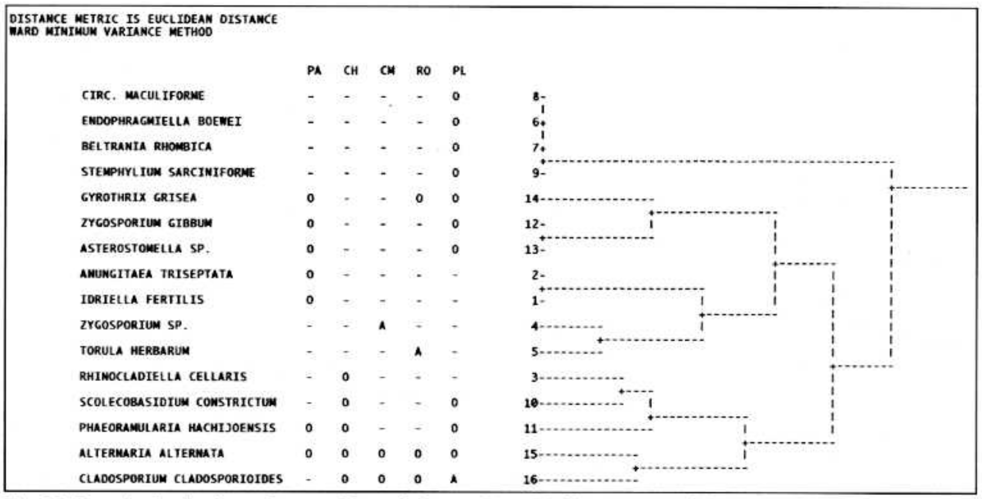
At San Antioco some groups of fungi are specialized on the different matrices.The cluster divide the fungal community in two groups, one composed by specie prevalently with adaptive colonization (with exception of *Anungiraea triseptata),* a second composed by species with optimal colonization in all matrices (Fig. 11). This group is also divided into two subgroups: one composed by species exclusively present as optimal colonizers on *P.*



DISTANCE METRIC IS EUCLIDEAN DISTANCE
WARD MINIMUM VARIANCE METHOD

	PT	OS	PL	CH	JP	
GYROTHRIX GRISEA	O	-	O	O	O	18
ALTERNARIA ALTERNATA	O	O	-	O	O	17
CLAD. CLADOSPORIOIDES	O	O	A	O	-	16
PHAEORAM.HACHIJOENSIS	-	O	O	O	-	15
RHINOCL CELLARIS	-	A	-	O	-	14
IDRIELLA FERTILIS	-	-	-	O	-	13
CYLINDR. OLIGOSPERMUM	A	-	-	O	-	12
CLAD. HERBARUM	A	-	-	A	-	2
ANUNGITAEA TRISEPTATA	O	-	-	-	-	1
TORULA HERBARUM	A	A	-	-	-	3
ZYGOSP. ECHINOSPORUM	-	A	-	-	-	5
SCOLEC. VARIABILE	-	-	A	A	-	4
BELTRANIA RHOMBICA	A	-	O	A	-	11
SCOLEC. CONSTRICTUM	-	-	O	-	-	10
ASTEROSTOMELLA SP.	-	-	O	-	-	8
ENDOPHRAGMIELLA BOEWEI	-	-	O	-	-	7
CRYPTOC. CONDENSATUM	-	-	O	-	-	9
ZYGOSPORIUM GIBBUM	-	A	O	-	-	6
CIRC. MACULIFORME	-	-	O	-	O	19

Fig. 11. Fungal colonization and type of the colonies on PT = *Phillyrea latifolia*, OS = *Olea sylvestris*, PL = *Pistacia lentiscus*, CH = *Chamaerops humilis*, JP = *Juniperus phoenicia* at San Antioco.

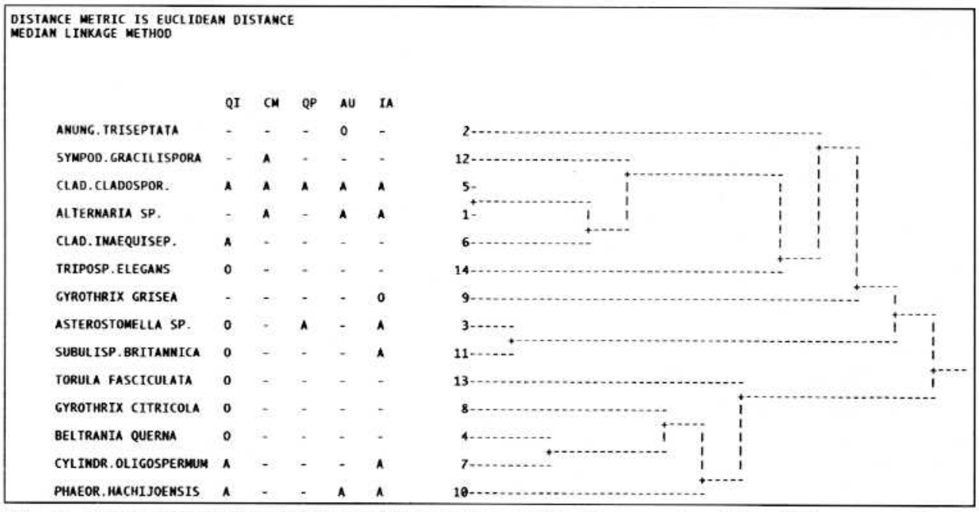


DISTANCE METRIC IS EUCLIDEAN DISTANCE
WARD MINIMUM VARIANCE METHOD

	PA	CH	CM	RO	PL	
CIRC. MACULIFORME	-	-	-	-	O	8
ENDOPHRAGMIELLA BOEWEI	-	-	-	-	O	6
BELTRANIA RHOMBICA	-	-	-	-	O	7
STEMPHYLIUM SARCINIFORME	-	-	-	-	O	9
GYROTHRIX GRISEA	O	-	-	O	O	14
ZYGOSPORIUM GIBBUM	O	-	-	-	O	12
ASTEROSTOMELLA SP.	O	-	-	-	O	13
ANUNGITAEA TRISEPTATA	O	-	-	-	-	2
IDRIELLA FERTILIS	O	-	-	-	-	1
ZYGOSPORIUM SP.	-	-	A	-	-	4
TORULA HERBARUM	-	-	-	A	-	5
RHINOCLADIELLA CELLARIS	-	O	-	-	-	3
SCOLECOBASIDIUM CONSTRICTUM	-	O	-	-	O	10
PHAEORAMULARIA HACHIJOENSIS	O	O	-	-	O	11
ALTERNARIA ALTERNATA	O	O	O	O	O	15
CLADOSPORIUM CLADOSPORIOIDES	-	O	O	O	A	16

Fig. 12. Fungal colonization and type of the colonies on PA = *Phillyrea angustifolia*, CH = *Chamaerops humilis*, CM = *Cistus monspeliensis*, RO = *Rosmarinus officinalis*, PL = *Pistacia lentiscus* at Torre del Sevo.

lentiscus (*Z. gibbum*, *E. boewei*, *Asterostomella* sp. *Cryptocoryneum condensatum*, *Scolecobasidium constrictum* and *B. rhombica*), a second composed by species with optimal colonization on *C. humilis* (*Idriella fertilis*, *Cylindrotrichum oligospermum* and *Rhinocladiella cellaris*).



DISTANCE METRIC IS EUCLIDEAN DISTANCE
MEDIAN LINKAGE METHOD

	QI	CM	QP	AU	IA
ANUNG.TRISEPTATA	-	-	-	0	-
SYMPOD.GRACILISPORA	-	A	-	-	-
CLAD.CLADOSPOR.	A	A	A	A	A
ALTERNARIA SP.	-	A	-	A	A
CLAD.INAEQUISEP.	A	-	-	-	-
TRIPOSP.ELEGANS	0	-	-	-	-
GYROTHRIX GRISEA	-	-	-	-	0
ASTEROSTOMELLA SP.	0	-	A	-	A
SUBULISP.BRITANNICA	0	-	-	-	A
TORULA FASCICULATA	0	-	-	-	-
GYROTHRIX CITRICOLA	0	-	-	-	-
BELTRANIA QUERNA	0	-	-	-	-
CYLINDR.OLIGOSPERMUM	A	-	-	-	A
PHAEOR.HACHIJOENSIS	A	-	-	A	A

Fig. 13. Fungal colonization and type of the colonies on QI = *Quercus ilex*, CM = *Cistus monspeliensis*, QP = *Quercus pubescens*, AU = *Arbutus unedo*, IA = *Ilex aquifolium* at La Madonnina.

Another group is composed by species present on more matrices.

Examining the associations through species we have found *C. maculiforme* present in 11 areas and in 7 is associated with *E. boewei* on *Pistacia lentiscus;* but in the area of Ingurtosu is optimal on *P. lentiscus,* on *Quercus ilex* and *Arbutus unedo.* Considering that the species is able to produce a very high number of spores and to colonize vegetal fragments almost partially transformed from the activity of other colonizers the distribution of *C. maculiforme* is certainly interesting.

Rarely *T. fasciculata* is simultaneously present on two or more matrices; at Caprera and La Madonnina is present as optimal with *B. querna* on *Q. ilex.* On *P. lentiscus* seems associated to *E. boewei* in the areas of Ingurtosu, Gonnesa, Capo S.Marco and Buggerru as optimal and at Capo Mannu as adaptive.

Asterostomella sp. as optimal seems associated to *B. querna* on *Q ilex* in the areas of Ingurtosu, Caprera, Gonnesa, Naracauli, La Madonnina; in the first 4 areas is also adaptive on *P. lentiscus* were *E. boewei* is always optimal.

As we have seen with previous researches (Pasqualetti & al. 1999) *B. rhombica is* a species able of high morphological variability in different environments and on different matrices. Nevertheless, on *P. leniscus* seems associated to *E. boewei* as optimal in 7 areas; only at Caprera is optimal on *Cistus salvifolius* (Fig. 2), and adaptive on *J. phoenicia, Phillyrea latifolia* and *C. humilis* in different areas.

A not negligible problem is that concerning the different beginning of colonization on the different matrices. Since all the matrices were simultaneously sampled is reasonable to think that on some matrices the fungal colonization starts before and could be delaied on others and this is related to chemical composition of the matrix and to environmental conditions. This could explain the absence or the rare presence of optimal colonization on some matrices. *Phillyrea angustifolia* has optimal colonizations only at Gonnesa and Torre del Sevo (Figs 3, 12): in these areas the optimal colonization is abundant on several matrices, presumably for favorable environmental conditions like a higher humidity.

Conclusions

Saprotrophic specialization is difficult to identify on leaves with advanced degree of decomposition, but is easy on the leaves of the superficial layer of the litter, nevertheless, despite the possible heterogeneity of degree of decomposition into the sample, seems possible to identify groups of microfungi characterizing the different matrices. This is evident for *E. boewei* on *P. lentiscus* and *B. querna* on *Q. ilex,* but also species like *T. fasciculata, C. maculiforme* and *P. hachijoensis* and other, with an improvement of the thecniques of investigation could be presumably possible to find for their a specialistic role.

The species with a clear saprotrophic specialization could be responsable of the beginning of the transformation processes, like primary colonizers.

Investigations on saprotrophic specialization seem profitable but they need more and more observations and mainly the collaboration of different research groups.

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