HACETTEPE UNIVERSITY
FACULTY OF SCIENCE
TURKEY

HACETTEPE BULLETIN OF NATURAL SCIENCES AND ENGINEERING

An Annual publication
Volume 29 / 2000
Series A BIOLOGY and CHEMISTRY

ISSN 0072 - 9221

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SERIES A

**A BULLETIN PUBLISHED BY
HACETTEPE UNIVERSITY
FACULTY OF SCIENCE**

Hacettepe University, Faculty of Science
06532 Beytepe, Ankara / TURKEY

Tel : (312) 299 20 80
Fax: (312) 299 20 93

Printed at the Science Faculty Press.

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BIOLOGY

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MACROFUNGI OF ÇEMİŞGEZEK (TUNCELİ) DISTRICT

Kenan Demirel Mahmut Nacar

Received 15.12.1997

Abstract

This study, is based on the macrofungi collected from Çemişgezek county of Tunceli province between 1995-1997. At the end of the study, 30 taxa belonging to 2 classes and 16 families have been identified. Two of them, *Coprinus stanglianus* Bender & Gröger. (*Coprinaceae*) and *Pholiota spumosa* (Fr.) Sing. (*Strophariaceae*)

Key Words: Macrofungi, Flora, Taxonomy, Çemişgezek, Turkey

Introduction

Although several studies were carried out on the macrofungi flora of our country(1), many regions have not been identified yet were recorded for the first time for Turkish mycoflora. Some floristic studies were also carried on by Gücin (2,3), Işıloğlu and Öder (4), Demirel (5), Demirel and Uzun (6) to determine the mycoflora of east anatolian region, but there were no floristic study related to Çemişgezek and its surroundings.

Çemişgezek is a town of Tunceli in the upper Fırat region of East Anatolia. It takes place at Eastwest of Tunceli and surrounded by Pertek and Hozat at east, Ovacık, Kemah and Erzurum at north, Ağın and Elazığ at west and Keban Dam Lake at south (Fig. 1). The town is 975 m above sea level and has a surface area of 877 square km. The research area has a semi-continental climate (7).

The aim of this study is to determine the macrofungi growing in Çemişgezek district and its surroundings.

Material & Method

Macrofungi specimens, which constitute the study material, were collected from study area by field trips carried out between 1995 and 1997. During the collection of specimens, morphological properties were noted and colour photographs were taken. After they were brought to the laboratory, spore prints were obtained and they were dried. Then, the specimens were stored as herbarium material in polyetylene bags. According to the data obtained by macroscopic and microscopic

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investigation of the specimens, their descriptions were prepared and identified with the help of relevant literature (8-11). The samples are kept in Biology Department of Science and Art Faculty of Y. Yıl University.

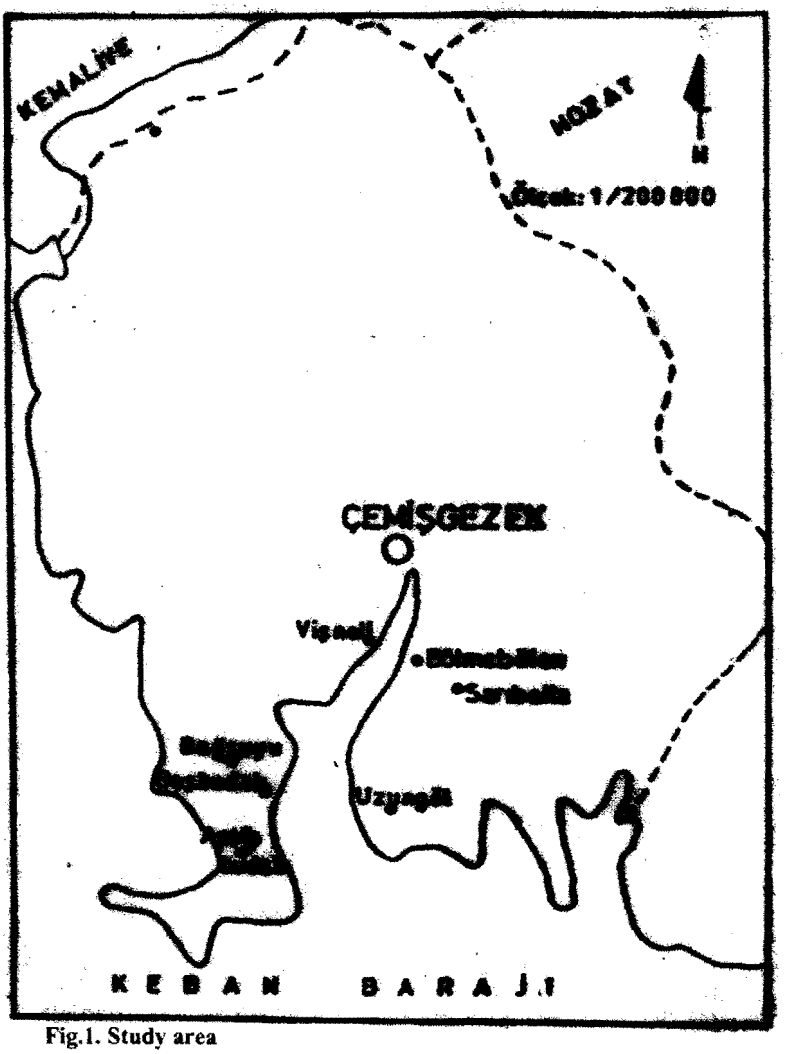

Fig.1. Study area

Results

At the end of this study, 28 taxa belonging to 2 classes and 16 families have been established. The identified species were listed and short descriptions of newly recorded species were given. In addition, collection site of the samples, habitats, collection date, edibility and personal herbarium number (N=Nacar) of each species have been added.

ASCOMYCETES

Morchellaceae

1. *Morchella conica* Pers.

Çemişgezek, Bölmebölen Village, under *Populus* trees, 10.05.1996, N. 111. Edible.

2. *Morchella esculenta* Pers. ex St. Amans.

Çemişgezek, Bölmebölen Village, under mixed wood, 5.1996. N.112. Edible.

Helvellaceae

3. *Helvella lacunosa* Afz. ex Fr.

Çemişgezek, Sakyol Village, under *Populus* trees, 20.05.1995. N. 006. Bölmebölen Village, swamp edge, 24.05.1995. N. 028. Aşağı Budak Village, under *Salix* trees, 05.04.1996. N. 061. Edible.

BASIDIOMYCETES

Astraeaceae

4. *Astraeus hygrometricus* (Pers.) Morg.

Çemişgezek, around Sakyol Village, brushwood area, 23.11.1995. N. 054. Bölmebölen Village, under *Quercus* trees, 10.09.1996. N. 093. Inedible.

Boletaceae

5. *Suillus luteus* (Fr.) S.F.Gray.

Çemişgezek, Bölmebölen Village, under coniferous trees, 10.09.1996. N. 092. Around Sakyol Village, under coniferous trees, 20.09.1997. N. 118. Edible.

Gomphidiaceae

6. *Gomphidius roseus* L.:Fr.

Çemişgezek, Bölmebölen Village,under coniferous trees, 10.09.1996. N. 094. Edible.

Pleurotaceae

7. *Lentinus tigrinus* (Bull.: Fr.) Fr.

Çemişgezek, Sakyol Village, on *Salix* stump, 20.05.1995. N. 002. Bölmebölen Village, on *Salix* stumps, 23.05.1995. N. 022. Bağsuyu Village, on *Salix* stumps, 28.10.1995. N. 030. Sakyol Village, on *Populus* stumps,, 23.11.1995. N. 050. Vişneli Village, on *Salix* stumps, 23.11.1995. N. 058. Edible.

8. *Pleurotus ostreatus* (Jacq.: Fr.) Kummer.

Çemişgezek, Bölmebölen Village, on *Salix* stumps, 21.05.1995. N. 012. Sarıbalta Village, on *Populus* stumps, 20.09.1997. N. 117. Edible.

Tricholomataceae

9. *Lepista inversa* (Scop.: Fr.) Pat.

Çemişgezek, Bölmebölen Village, under mixed woods, 21.05.1995. N. 098.

Edible.

Amanitaceae

10. *Amanita ovoidea* (Bull.: Fr.) Quel.

Çemişgezek, Bağsuyu Village, under *Quercus* trees,, 28.10.1995. N. 033. Bölmebölen Village, under mixed woods, 22.10,1996. N. 095. Edible.

11. *Amanita submembranacea* (Bon.) Gröger.

Çemişgezek, Sarıbalta Village, under *Quercus* trees, 23.05.1995. N. 016. under *Quercus* trees, 20.05.1996. N. 075. Inedible.

Agaricaceae

12. *Agaricus campestris* (L.) Fr.

Çemişgezek, Bölmebölen Village, meadows, 16.11.1996. N. 108. Edible.

Coprinaceae

13. *Coprinus comatus* (Müll.: Fr.) S.F: Gray.

Çemişgezek, Bölmebölen Village, garden, 23.05.1995. N. 019. Edible.

14. *Coprinus atramentarius* (Bull.: Fr.) Fr.

Çemişgezek, Aşağı Budak Village, meadows, 04.04.1996. N. 065. Bölmebölen Village, under *Populus* trees, 10.06.1997. N. 114. Poisonous.

15. *Coprinus micaceus* (Bull.: Fr.) Fr.

Çemişgezek, Bölmebölen Village, on broad-leaved stump, 21.05.1995. N. 015. Edible.

16. *Coprinus stanglianus* Bender & Gröger.

Cap 2-5 cm across, ovoid or cylindrical when young, convex to bell shaped when old, whitish and covered with a woolly veil at first, then becomes covered with silky fibrils, grey-brown when mature. Flesh white and thin. Gills free, white at first, then pink and black at maturity.

Stem 8-15 cm tall, cylindrical, sometimes curved toward the base, hollow and fragile when old, surface smooth, white and have a woolly zone toward the base (Fig 2a). Spores 5-7x 8-10.5 µ, elliptic to almond shaped (Fig 2b).

Çemişgezek, Aşağı Budak Village, meadows, 05.04.1996. N. 066. under *Populus* trees, 15.05.1996. N. 069. Inedible.

Bolbitiaceae

17. *Agrocybe molesta* (Lasch.) Sing.

Çemişgezek, Bölmebölen Village, under *Populus* trees, 24.05.1995. N. 025. Edible.

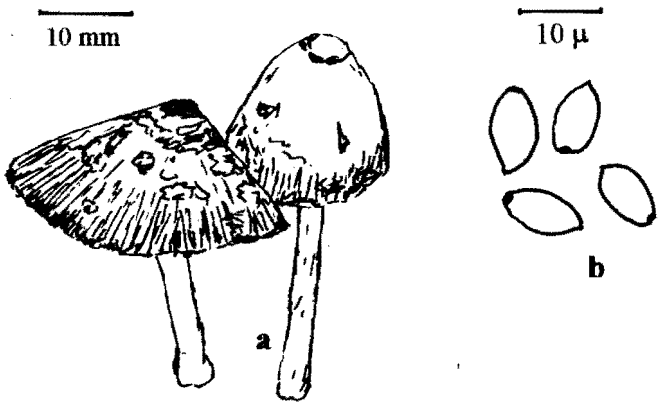

Fig. 2. *Coprinus stanglianus* **a**) Fruit body **b**) Spores

18. *Agrocybe paludosa* (Lange.) Kühn & Romagn.

Çemişgezek, Vişneli Village, meadows, 23.11.1995. N. 056. Inedible.

Strophariaceae

19. *Pholiota spumosa* (Fr.) Sing.

Cap 2-5 cm across, orange yellow or reddish brown, at first convex, then flattened-slightly depressed, smooth, very sticky. Flesh greenish-yellow, more reddish in stem. Gills at first bright-yellow then brownish-grey, crowded, adnate. Stem 4-7 cm tall, lemon yellow, brownish at the base, equal or tapering slightly downwards, slender, finely fibrous (Fig. 3a). Spores ellipsoid, smooth, greyish-yellow, 3-4.5x5.5-7.8 µ (Fig. 3b).

Çemişgezek, Aşağı Budak Village, under coniferous trees, 20.11.1995. N. 048. Inedible.

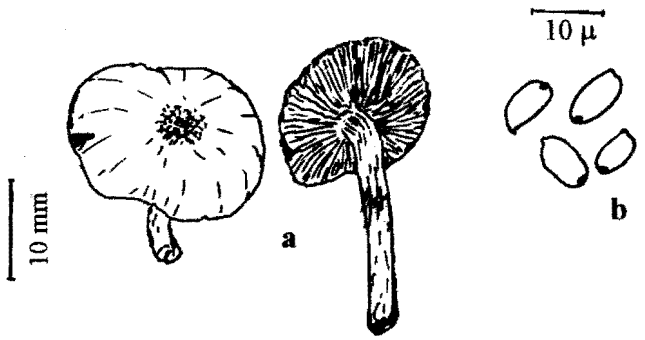

Fig. 3. *Pholiota spumosa* **a**) Fruit body **b**) Spores

Cortinariaceae

20. *Inocybe fastigiata* (Schaeff.: Fr.) Quel.

Çemişgezek, Bölmebölen Village, under mixed woods, 24.05. 1995. N. 026.

Poisonous.

Hymenochaetaceae

21. *Inonotus dryadeus* (Pers.: Fr.) Murr.

Çemişgezek, Sarıbalta Village, on *Salix* wood, 22.10.1996. N. 097. Inedible.

22. *Phellinus robustus* (Karst.) Boourd.&Galz.

Çemişgezek, Bağsuyu Village, on *Quercus* wood, 10.09.1996. N. 088. Bağsuyu Village, on *Morus* wood, 10.09.1996. N. 089.Inedible.

23. *Phellinus tuberculosus* (Baumg.) Niemala.

Çemişgezek, Uzungöl Village, on *Prunus* wood, 23.05.1995. N. 018. Vişneli Village, on *Prunus* wood, 23.15.1995. N. 055. Inedible.

Polyporaceae

24. *Funalia troqii* (Berk.) Bond. et Sing.

Çemişgezek, Sakyol Village, on *Populus* stumps, 20.05.1995. N. 002. Bölmebölen Villge, on *Populus* stumps, 10.06.1997. N. 115.Inedible.

Russulaceae

25. *Russula betularum* Hora.

Çemişgezek, Sarıbalta Villge. under *Quercus* trees, 20.05.1996. N. 078. Poisonous.

26. *Russula delica* Fr.

Çemişgezek, Sarıbalta Village, under *Quercus* trees, 10.06.1996. N. 081. Sarıbalta Village, in mixed woods, 05.06.1996. N. 083. Bölmebölen Village, under *Quercus* woods, 12.08.1997. N. 116. Edible.

27. *Russula ochroleuca* (Pers.) Fr.

Çemişgezek, Sarıbalta Village, under *Quercus* woods, 20.05.1996. N. 073. Edible.

28. *Lactarius piperatus* (L.:Fr.)S.F.Gray

Çemişgezek, Bağsuyu Village, under *Quercus* woods, 05.06.1996. N. 085. Edible.

Discussions

As a result of this study 28 taxa belonging to 16 families which take place in Ascomycetes and Basidiomycetes were identified. Among 28 species 14 are edible, 11 are inedible and 3 are poisonous. While *Morchella conica*, *M. esculenta*, *Pleurotus ostreatus*, *Agaricus campestris*, *Russula delica*, *R. ochroleuca* and *Lactarius piperatus* were found to be known and eaten, the other species are not known in the area.

The presence of similarities between the result of this study and the studies which were carried out by Gücin (2,3), Işıloğlu and Öder (4), Demirel (5), Demirel and Uzun (6), may be due to the climatic and floristic similarities of the study areas.

On the other hand, as a result of literature survey, it is found that *Coprinus stanglianus* and *Pholiota spumosa* were recorded for the first time from Turkey. With the addition of 2 macrofungi species it has been contributed to the richness of macrofungi flora of our country.

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Hacettepe Bulletin of Natural Sciences and Engineering
Series A, 28 (2000), 8-21

PLANKTONIC ORGANISMS OF THE MANYAS LAKE

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Received 27.09.1999 Section, Beytepe/Ankara

Abstract

According to Ramsar Site, Manyas lake was declared one of the A"class wetland. The planktonic samples were collected from the lake between 1996 – 1997. Planktonic organisms of Manyas lake were evaluated systematically and discussed with the old literatures and the differences in the sampling date of the planktonic organisms were interpreted. In the lake a totally 93 species and 29 genera of phytoplanktonic organisms were determined. Among zooplanktonic organisms 11 species belong to Cladocera, 3 species to Copepoda and 16 species Rotifera were identified.

Key Words: Phytoplankton, Zooplankton, Manyas Lake

Introduction

The investigation of the planktonic organisms of Manyas lake was begun with Mann (1). After Mann (1940), the other researchers have given some publications about this lake; for example, Noodt (2) on copepods; Muckle (3) on cladocerans; Numann (4) on cyprinid fishes and limnology; Akdağ (5) on Cladocera and Copepod and latelly Ongan (6) on the hydrography and physico-chemical parameters of the lake water. Furthermore, Ustaoğlu (7) surveyed the zooplanktonic organisms.

In this study the planktonic organisms were investigated and the species list was given and the differences were discussed with the old literatures.

Material and Method

The planktonic organisms were collected between March 1996 and August 1997 from six stations (Fig.1). The plankton samples were taken by using plankton nets (mesh size 30 and 44 μm) by drawing horizantally 100 meters. Then the samples were fixed with 4 % formaldehit.

To determine the frequency of the phytoplanktonic organisms , the samples were taken 30 cm deep from the surface and fixed in the field. The frequencies of the samples were analysed in terms of individual /ml (Lund 8).The permanent slides were developed only to determine the diatom species using the metod of (Round , 9).

The following sources were used during the process of identification; 17-31.

The zooplanktonic species were identified using Hutchinson (10), Pejler (11) , Kuttikova (12) , Koste,(13,14), Kiefer. (15) and Herbst, (16).

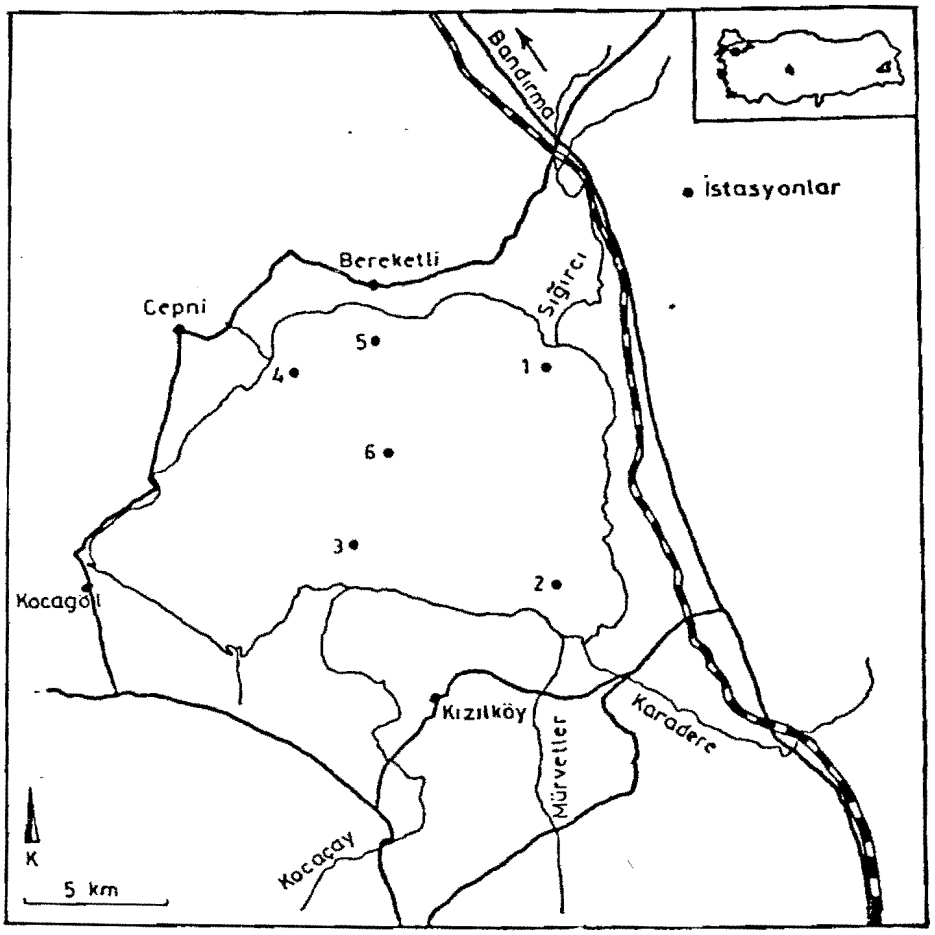

Fig 1:The study Area and The Stations

Results

Phytoplanktonic Organisms

The phytoplanktonic organisms living in the Manyas lake is given below.

Bacillariophyta
Aulocosira ambigua (Grun.) O. Müller
Aulocosira granulata (Ehr.) Ralfs.
Melosira varians Agardh
Cyclotella menenghiana Kütz.
C. ocellata Pantocksek
Diatoma vulgare Bory
D. elongatum Agardh
Fragilaria contruens (Ehr.) Grun.
F. pinnata Ehr.
F. capucina Demazieres
S. capitata Ehr.
Synedra ulna (Nitzsch.) Ehr.
S. pulchella Kütz.
S. acus Kütz.
S. berolinensis Lemm.
Cocconeis placentula Ehr.
C. placentula var. *euglypta* (Ehr.) Cleve.
Achnanthes microcephala (Kütz.) Grun.
A. minutissima Kütz.
Rhoicosphaenia curvata (Kütz.) Grun.
Mastogloia sp.
Neidium iridis Kütz.
Anomonoeis sphaerophora (Kütz.) Pfitzer
Stauroneis phoenicenteron
Navicula cuspitata Kütz.
N. radiosa Kütz.
N. hungarica var. *capitata* (Ehr.) Cleve
N. cryptocephala Kütz.
Pinnularia viridis (Nitzsch.) Ehr.
Amphiprora sp.
Cymbella cistula (Hemp.) Grun.
C. lanceolata (Ehr.) Cleve
C. microcephala Grun.
Amphora ovalis Kütz.
Gomphonema costrictum Ehr.
G. parvalum (Kütz.) Grun.
Epithemia turgida (Ehr.) Kütz.
E. sorex Kütz.
Gyrosigma sp.
Rhoipalodia gibba (Ehr.) O. Müll.
R. gibba var. ventricosa (Ehr.) Grun.
Hantzschia amphioxys (Ehr.) Grun.
Bacillaria paxillifer (Müll.) Hendey
Nitzschia sigmoidea (Ehr.) W. Smith
N. recta Hantzch.
N. amphibia Grun.
Cymatopleura solea (Breb.) W. Smith
C. elliptica (Breb.) W. Smith
Surirella ovalis Breb.
S. robusta Ehr.
S. biseriata Breb.
Chlorophyta
Eudorina elegans Ehr.
Pediastrum boryanum (Turp.) Menegh. 1840
P. simplex Meyen 1829
P. simplex var. echinulatum Wittr 1883
P. simplex var. biwaense Fukush
P. duplex Meyen 1829
P. duplex var. gracillimum W. & G. S. West 1895

P. tetras (Ehr.) Ralfs 1844
Oocystis sp.
O. borgei Snow 1903
Ankistrodesmus falcatus (Corda) Ralfs
Monoraphidium irregulare (G. M. Smith) Kom-Leng.
M. minutum (Näg.) Kom-Legn. 1969
Tetraedron minimum (A. Br.) Han.
T. trigorum (Naeg.) Hansg.
Coelastrum sp.
Scenedesmus quadricauda (Turp.) Breb. sensu Chod. 1913
S. acutus Meyen 1829
S. intermedius Chod. 1926
S. acuminatus (Lagerh.) Chod.
S. acuminatus var. acuminatus (Lagerh.) Chod.
S. disciformis (Chod.) Fott & Kom. 1960
Ulotrix sp.
Oedogonium sp.
Spirogyra spp.
Zygnema sp.
Maugetio sp.
Closterium dianaea Ehr. ex Ralfs. 1848
C. attenuatum Ralfs. 1848
C. acicularis T. West 1860
Cosmarium granatum Breb. ex Ralfs 1848
C. obtusatum (Schmidle) Schmidle 1898
Euastrum insulare (Wittr.) Roy 1883
Staurastrum spp.
Stigeoclonium sp.
Tetrastrum sp.
Cyanophyta
Microcystis flos-aquae (Wittr.) Kirchn.
M. aeruginosa Kütz.
Chrococcus turgidus (Kütz.) Naeg.
Gomphosphaeria aponina Kütz.
Merismopedia glauca (Ehr.) Kütz.
M. tenuissima Lemm.
Nodularia sp.
Anabaena affinis Lemm.
A. circinalis *Raben. et Born et Floh.*
Pseudoanabaena sp.
Spirulina sp.
S. major Kütz.
Oscillatoria rubescens D.C.
O. tenius Agardh
O. limosa Agardh
Gleotrichia sp.
Euglenophyta
Euglena oxyuris Schmarda
E. clavata Skuja
E. polymorpha Dang.
E. acus Ehr.
Lepocinclus sp.
Phacus orbicularis Hübn.
P. curvicauda Swirreko
Trachelomonas sp.
Pyrrophyta
Peridinium spp.
Cryptophyta
Cryptomonas spp.

In the Manyas lake, the phytoplanktonic organisms exhibits a great change up to the seasons (Fig.2-7). During the study the most dominant group was Bacillariophyta, within this group, *Diatoma* was increased in the fourth station by 216.94 ind/ml. This genera was high number all other stations too.The second dominant organism was *Melosira*. Within the Chlorophyta, *Scenedesmus* and *Pediastrum* were more common genera than others.

In May 24,1996, it was indicated that the total organism was more than the former sampling time. And the most dominant organism was again *Diatome*. It's highest rate was found as 795 ind/ml in the second station. In the same station *Nitszchia* spp. were the dominant organisms of diatom.

Within Chlorophyta, *Scenedesmus* and *Pediastrum* were the more common taxa. In the second station, *Scenedesmus* was an important part of the total organism with 460 ind./ml.Within Cyanophyta, *Anabaena affinis* was the second dominant organism. *Anabaena circinales* was recorded in high numbers .

In November 11, 1996, it was observed that the total number of organisms had decreased in an important ratio. There was no dominant organism. *Diatoma* spp., *Closterium* spp., *Scenedesmus* spp. *Gomphosphaeria aponia* commonly appeared in the lake even though the numbers were small.

In August 24,1997 the densitiy of *Anabaena affinis* was so high that anyone looking at the lake could see it with a gren-blue colour. *Anabaena affinis* reached maximum value particularly in the fourth and seventh stations, between 2113- 2600. ind./ml respectively. Furthermore, this species became the dominant organism of the entire surface of the lake.

As a general conclusion, it could be stated that during winter and spring periods, members of Bacilloriophyta and sometimes Chlorophyta were dominant while during summer period Cyanophyta group were dominant. The species belonging to Euglenophyta, Pyrrophyta, Crytophyta divisions had relatively small frequencies. Furthermore, these could not be identified in many sampling time and stations.

Throughout the stations in the Manyas lake, the least chlorophl-a value, that is μgr/lt 17.33, was found in mouth of Dutlu Streamlet in May 1996 and the highest value was 262.27 μgr in the mouth of Kocaçay. Figure 8-13 depicts the relations between the amount of chl-a found in the Manyas lake and the total phytoplanktonic organisms.

Zooplanktonic Organisms

The species of the Rotifera found in the Manyas lake and their existence in the lake based on the sampling data are given in Table 1. Cladocera and Copepoda species list were given as below

Table 1.The Species list of Rotifera

	March 96	May 96	November 96	August 97
Brachionus angularis Gosse, 1851	+	+	+	+
Brachionus calyciflorus Pallas, 1776	+	-	-	+
Brachionus quadridentatus Hermann, 1783	+	+	-	-
Brachionus diversicornis (Daday, 1883)	-	+	+	+
Notholca squamula (O.F.Müller, 1786)	+	-	+	+
Keratella quadrata (O.F.Müller, 1786)	+	+	+	+
Keratella cochlearis (Gosse, 1881)	-	+	-	+
Trichocerca cylindrica (Imhof, 1891)	-	-	-	+
Trichocerca similis (Wierzejski, 1893)	-	-	+	+
Polyarthra vulgaris Carlin 1943	-	+	+	-
Polyarthra euryptera (Wierzejski, 1893)	-	-	+	+
Hexartha oxyurus (Semov, 1903)	-	-	+	+
Filinia longiseta (Ehrenberg, 1834)	+	-	-	+
Conochilus dossuarius (Hudson, 1885)	-	-	+	-
Testudinella patina (Hermann, 1783)	+	-	-	-
Pompholx complanata Gosse, 1851	-	+	-	-

Species of Cladocera and Copepoda (Anonymous, 32)

Diaphanosoma orghidani Negrea, 1981
Daphnia cucullata Sars, 1962
Simocephalus vetulus (O. F. Müller, 1776)
Ceriodaphnia reticulata (Jurine, 1820)
Scapholeberis kingi Sars, 1903
Moina micrura Kurz, 1874
Bosmina longirostris (O. F. Müller, 1785)
Chydorus sphaericus (O. F. Müller, 1776)
Alona rectangula Sars, 1862
Alona quadrangularis (O. F. Müller, 1785)
Leydigia acanthocercoides (Fischer, 1848)
Aretodiaptomus pectinicornis (Wierzejski, 1887)
Cyclops vicinus *Uljanin*, 1875
Acanthocyclops robustus (G. O. Sars, 1863)

In all the stations, *Brachionus cacyciflorus*, *Brachionus angularis* and *Filinia longiseta* were found in March 1996. *Notholca squamula* and *Brachionus quadridentatus* were also observed in the same sampling period. *Brachionus* species such as *Brachionus diverciconis*, *Brachionus quadridentatus* and *Brachionus angularis* were recorded especially following stations; Karadere, Sığırcı Streamlet Mouth, Bereketli in May 1996. Also in the same month, *Keratalla quadrata* was found intensively in the stations Sığırcı Streamlet Mound,

Karadere and open water. Again *Keratalla cochlearis, Polyarthra vulgaris, Brachionus diversicornis* were observed frequently in the same period.

In November 1996, some species such as *Brachionus diversicornis, Brachionus angularis* and *Polyarthra vulgaris, Hexarthra oxyurus, Conochilus dossuarius, Trichocarca similis* and *Notholca squamula* species were found extensively in the stations Karadere, Bereketli and in the pelajik region.

In August 1997, *Brachionus diversicornis, Keratella cochlearis, Polyarthra europtera* were high in number *Notholca squamula, Trichocerca similis, Hexartha oxyuus, Polyarthra europtera* also were abundant species.

Discussion

Phytoplanktonic Organisms

In Manyas lake, the recorded temperature value was between 4.5-26 ^{o}C; dissolved oxygen parameter was between 0.2-8.2 mg/l; PH was between 7.53-9.52; Conductivity was between 325-2900 μS and Secchi Depth was between 15.67-57.33 cm (Anonymous, 32).

Distribution of phytoplanktonic organisms are affected by the physical and chemical properties of water. The physical and chemical properties of lake water exhibit great variance throughout the year; and affect directly the biological life. In relation to this fact, distrubition of the total phytoplanktonic organism in the Manyas Lake could be stated as follows: the phytoplankton density had decreced to lower level at the end of winter and gradually increaced during the spring period. During the winter sampling period, it had decreased dramatically. This finding is parallel with the results of other studies performed on the distrubition of phyplanktonic organisms. (Reynolds, 33) Their food becomes limited in winter; whereas it incereases in summer. Furthermore, heat and light also affect this fact.

51 taxa belonging to Bacillariophyta had been identified. Within this division *Synedra* was recorded as the most dominant organism. This species is the dominant organism during the spring and fall sampling months. According to Huchinson's (10) ecological classification, *Synedra* and *Melosira* are the characteristic organisms of the eutrophic lakes. Furthermore *Synedra* may be encountered frequently in the lake located at higher level (Bruce et. al. 34). Similarly Reynolds (33) and Husted (26) stated that these in the environments in which they increased could be regarded as an indicator of eutrophy. Additionally, it is known that these

taxa belonging to Bacillariophyta have reached a rate that may be regarded as significant in some eutrophic lakes and reservations in Turkey (Akbulut 35 ; Demirsoy et. al. 36; Gönülol & Çolak,37 ; 38).

36 taxa within the division Chlorophyta were identified. The most dominant genera of this division were *Scenedesmus* and *Pediastrum*. According to Harper (39) and Hutchinson (10), both genera are taxa of eutrophic lakes and they are mostly dominant. Additionally, *Closterium* was found as the dominant organism within Chlorophyta in November 1996. This increases match the results of Reynold (33) and Round (9) (assumptions that *Closterium*, *Cosmarium* and *Staurastrum* could be dominant in eutrophic lakes during summer and fall periods).

Blue-green algae are represented by 16 taxa in Manyas Lake. Altough this division is rare in terms of species number, it has become the most dominant organism within the total phyplankton in spring and summer sampling period. Particularly *Anabaena affinis* and *Anabaena circinalis* had reached the maximum density during the summer period. *Anabaena* species become so dence in Agust that it could change the colour of the Manyas Lake.

It is known that blue-green algae increase in the high productivite lakes during the summer period, in which the temperature of lake water increases. It includes such species as *Microcystis*, *Aphanizomenon* and *Anabaena* (Harper 39; Brock, 40;). The Anabaena species increased in the Manyas Lake reached a very high level particularly in IV and VI stations (2113 ind./ ml. and 2600 ind./ml. respectively). It is seen that they increase more in the summer period than other sampling phases when the values N and P are analysed becauce members of Cyanophyta have the ability to fix free nitrogen. Their development is mostly related to the quantity of nitrogen compozites within the environment.

In Manyas lake, the recorded nitrate concentration was between 11.56-13.51 mg/l and nitrite concentration was 1 mg/l in March 1996 and 2.63 mg/l in May 1996. The phosphate concentration was between 16.31-16.53 (Anonymous, 32).

As a result of increase in the nutrients, temparature and intensity and the light period, blue-green algae in the Manyas Lake had increased. The algal bloom which is a characteristic of the eutropic lakes can lead to some problems. The excess of nutrient in the water system causes the increase in the primary production combining with other physical factors and this

causes negative outcomes. Particularly increase in tcertain ratio of blue-green algae might lead to a toxical effect on the other species (from planktonic organisms to mammalls and birds) (Bernardi & Güssani, 41) [thus it has been found out that the species belonging to *Anabaena* that increased highly in the Manyas Lake produced toxical items (Reynolds 33; Harris 42)]. Additionally algal bloom limits to pass of light into water and decreases the amount of dissolved oxygen in deep parts. There are many factors that cause algal bloom such as nutrient richness. These factors are mainly, those that affect the physiological development of species and that are external. As a result of industrial development near the lake, it has become a receiver of waste. This fact modifies the physical and chemical pattern of the water system and therefore damages ecological balance in the lake. This damage has reached a certain level that could change the types variance and frequency of the alg that are the primary producer of the Manyas Lake. To slow down this high level productive process, it is necessary to refine the industrial pollution sources and to implement carefully the agricultural activities.

While identifying 8 taxa from Euglenophyta, one taxon from both Phyrrophyta and Cryptophyta was also found. However their frequencies were recorded as low.

One of the indirect methods in determining the primary production in the lakes is chl-a (Round 43). Determination of chl-a gives information on the frequency of phytoplanktonic organisms and they have a parallel relationship with each other. In the stations testing and measurement tasks were carried out in the lake. There are a linear relationship between total phytoplanktonic organism and chl-a (Figure 8-13)

As a result, Bacillariophyta is the dominant organism in terms of species number. The other dominant phytoplanktonic groups are as follows; Chlorophyta, Cyanophyta, Euglenophyta, Pyrrophyta and Cryptophyta. Balık et.al (44) reached similar conclusions on the species richness of phytoplanktonic organisms. However, certain species in the various divisions were not recorded in the current study which were recorded in their study. Furthermore, in addition to certain species in other divisions, the divisions of Pyrrophyta and Cryptophyta are also presented in this study.

Zooplanktonic Organisms

The various researchers have used the rotiferan species as an indicator organisim in determining the water quality of the freshwater ecosystems. Seksena (45) regards the

Brachionus type as an indicator of eutrophication, whereas Baker (46) stated that *Keratella quadrata, Keratella cochlearis* and *Brachionus angularis* existed abundantly in the eutrophic lakes. These species were recorded in the Manyas Lake almost in all seasons. However their population density are not on the avarage level in the shallow and very eutrophic lakes.

In the Manyas Lake, the rotiferan species increas genarally in August and Nowember particularly during the sampling periods in which algae are frequent, the population density of the rotiferan species also increase. Most rotiferan species could be feed with either phytoplankton or on particules. Arndt (47) stated that rotatoria could be fed on the increased bacteria and unicellular species when their food concenration is lower. However since the feeding characteristics of such types as *Brachionus, Keratella* and *Polyarthra* found in the Manyas Lake range widely, they could not be determined almost in each season. Most rotifera species found in the Manyas Lake are cosmopolit and then it is possible for them to exist in all fresh water systems.The lake is rich in terms of Rotifera species. As a result of analyses, the most recent work carried out by Ustaoğlu (1990) recorded the same species, found in this study. However, *Brachionus quadridentatus, Pompholyx complanata, Trichocerca similis* and *Testudinella patina* are added to the list of Ustaoğlu (7).

Mann (1) carried out the first survey on the identification of the types of the zooplanktonic organisms in the Manyas lake. He collected three samples in July 26,1934, in July 17,1935 and in January 12,1936 and found out the existence of the following species *Moina brachiata, Diaponasoma brachyurum, Leptodora kindtii, Eucyclops serrulatus, Mesocyclops leucarti, Cyclops vicinus, Thermocyclops hyalinus.*

Muckle (3) found out the excistence *Daphnia cuculata* in the Manyas lake. Noodt (2) determined that *Nitocra hybernica* belonging to Harpacticoid copepods living in the Manyas lake, and Kieffer (48) reported that *Eucyclops serrueatus* and *Mesocyclop leukarti* species existed in the Manyas lake.

Comparing with the results of the other studies on the zooplanktonic species (Cladocera and Copepoda) living in the Manyas Lake indicates that the species recorded in the research is more. However this difference seems to be a result of the fact that the former studies are not so detailed. Such types as *Moina brachiata, Diaphanosama brachyurum* which were claimed to be recorded in the former studies seem to be identified falsely and indeed these species are *Moina micrura* and *Diaphanosoma orghidani* . Mann (1) stated that there was *Leptodora*

kindtii in the lake. But in this study it was not recorded. Additionally *Eucyclops serrulatus* and *Mesocyclops leuckarti* were not also found in the study. The most dominant organisms during the sampling periods in the Manyas Lake are *Cyclops vicinus, Acanthocyclops robustus, Bosmina longirostis* and *Daphnia cuculata* (Anonymous, 32).

Acknowledgement

This work, part of a project and funded by the Ministry of Environment (no: 94K100010) and our sincere thanks to project director Prof. Dr. Füsun Erk'akan and other researchers.

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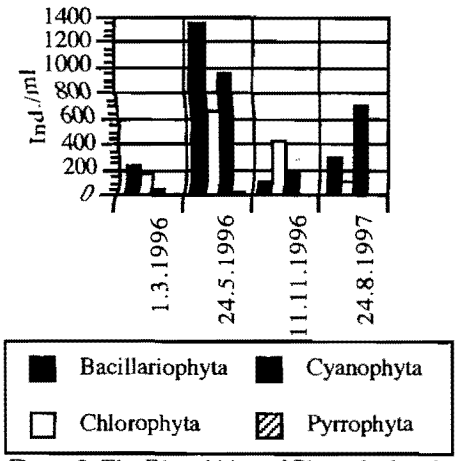

Figure 2: The Distrubition of Phytoplanktonic Organisims in I. Station

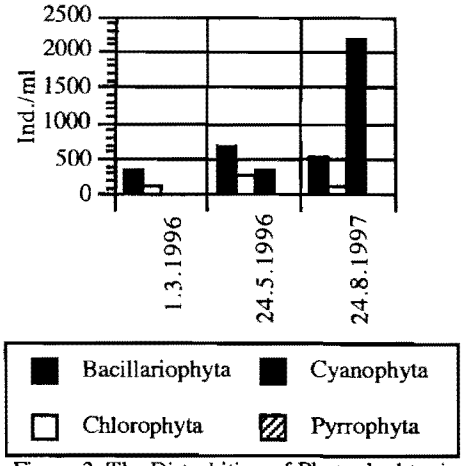

Figure 3: The Distrubition of Phytoplanktonic Organisims in II. Station

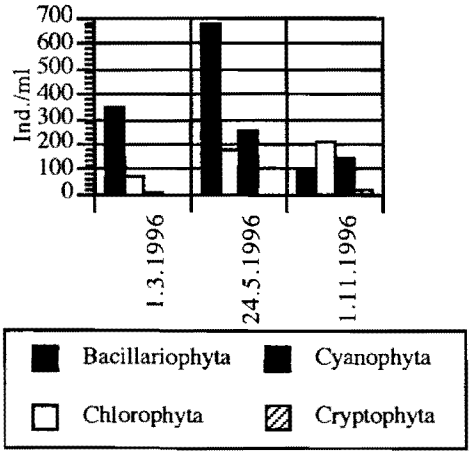

Figure 4: The Distrubition of Phytoplanktonic Organisims in III. Station

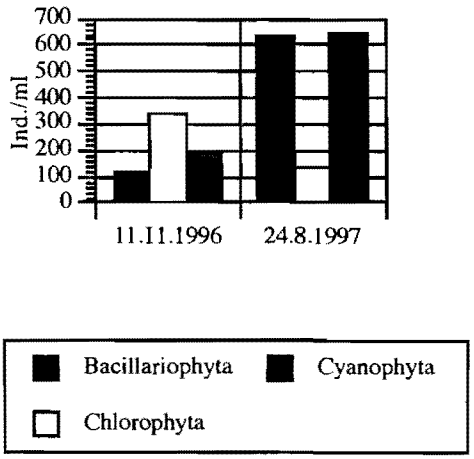

Figure 5: The Distrubition of Phytoplanktonic Organisims in IV. Station

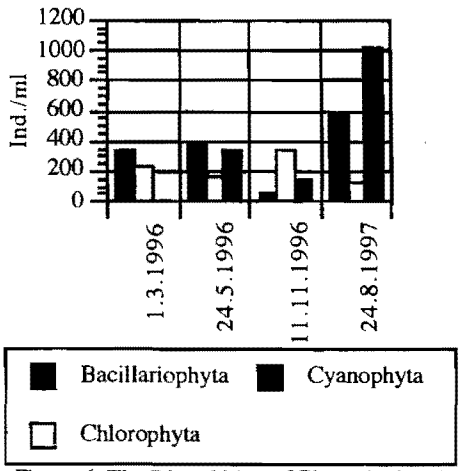

Figure 6: The Distrubition of Phytoplanktonic Organisims in V. Station

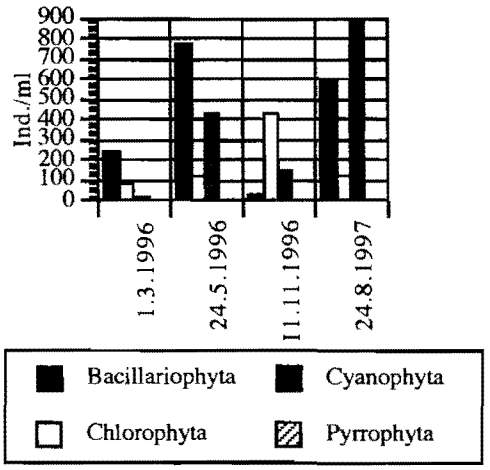

Figure 7: The Distrubition of Phytoplanktonic Organisims in VI. Station

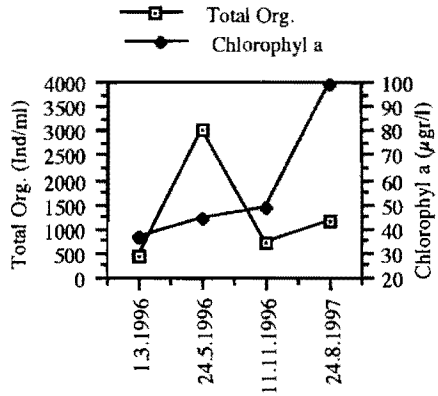

Figure 8: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in I. Station

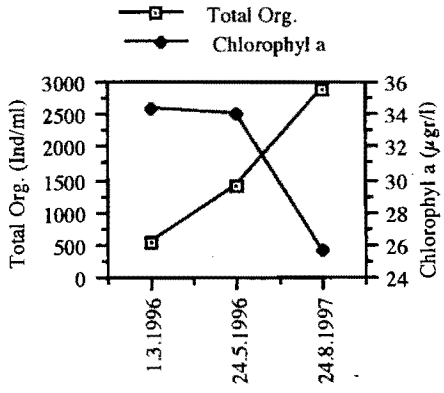

Figure 9: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in II. Station

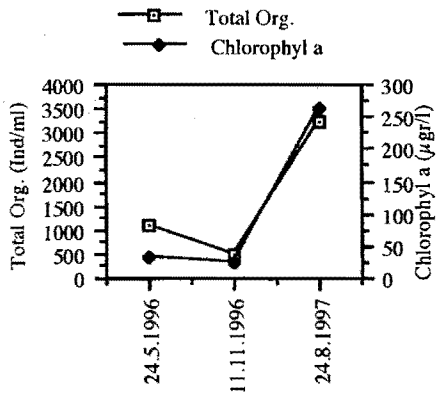

Figure 10: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in III. Station

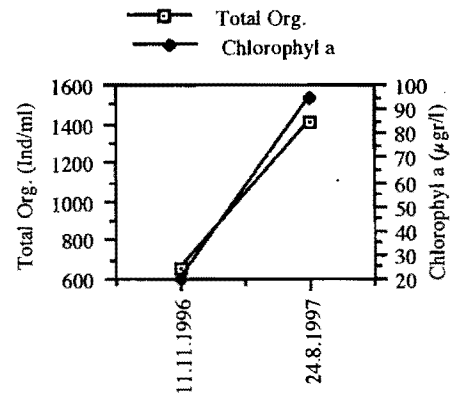

Figure 11: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in IV. Station

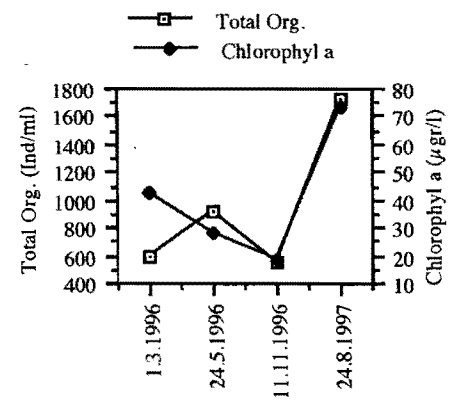

Figure 12: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in V. Station

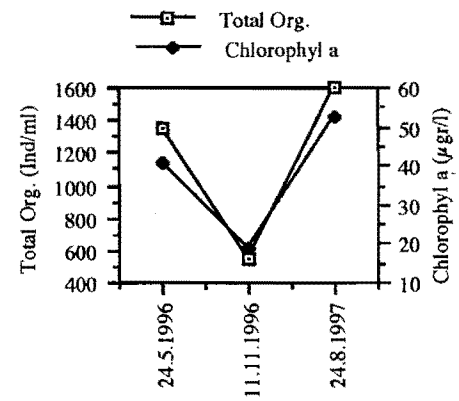

Figure 13: Comperation between Total Phytoplanktonic Org. and Chlorophyl a in VI. Station

Hacettepe Bulletin of Natural Sciences and Engineering
Series A, 28 (2000), 22-32

AN ETHNOBOTANICAL STUDY IN THE KARAGÜNEY MOUNTAIN (KIRIKKALE): USES, NUTRIATIONAL VALUE AND VERNACULAR NAMES

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Received 14.12.1999

Abstract

In this paper, an ethnobotanical study is given. Folkloric information and a taxonomic list based on the identification of the plants collected from the Karagüney mountain (Kırıkkale) are given. In the region, 100 taxa have vernacular names. It has recorded that 10 taxa are cultivated and 5 are used for ornamentation while 6 are used in folk medicine, and 50 taxa are weedy plants and used for food or various purposes by local people. Most of the ethnobotanical informations are firstly reported.

Key words: Ethnobotany, Kırıkkale, vernacular plant names, Turkey.

1. Introduction

The floristic richness of Turkey, and the ethnobotanical importance of its flora have long been well known by botanists. The developments on the socio-economical status of the people and the increasing in the drug trade have been replacing contemporary medicine by the traditional folk medicine. The lost of the practice of traditional medicine are also caused of the obscurity, and finally lost of the whole folkloric information. Folk medicine was also of great importance in the country[1, 2, 3]. Many kind of domestic plants are firstly cultivated in the area or neighbouring areas of Turkey[4]. Therefore, plant and seed collection for feeding, early farming, domestication and different uses of plants have deeply historical backgrounds in Turkey. Also this cultures will be seen in the folklore, literature and languages. In spite of the nearly 9000 plant species are grows in the area, 3000 local plant names are detected in Turkish or other dialect of its by the lingustician[3]. But this local names have not their scientific names and they only includes explanations mean of the name. However, vernacular plant names have been corresponding to scientific plant names last decades, parallel to research in the Turkey. Also, ethnobotanical studies on the Turkish flora are increasing[5]. In addition, Turkey occupies a large area in the Fertile Crescent[6], the area is centre of the civilisation and domestication of many plants specis.

Folk medicine and ethnobotanical studies have increased since the publication of the first volume of the Turkish flora[7]. Comprehensive studies in medicinal plants in Turkey have been carried out by Baytop, Sezik, Yeşilada and some sistematist and pharmacist[1, 8, 9, 10, 11, 12, 13, 14]. Ethnobotanical works, having vernacular names have been done by several plant systematist[15, 16, 17]. Alpınar[16] has established an archive on vernacular plant names in the Pharmacy faculty at the University of İstanbul.

The topographical structure of Kırıkkale and its environs are characterised by low mountainous areas and the region is covered mainly with crop fields. According to my observations and interview with the inhabitants, deforestation has long been underway due to human effect. Intensive agricultural activities have played an important role in the forest decline. It is known that the area was once covered with the *Pinus nigra* forest, nearly a hundred years ago. At the present time, the *Quercus* scrub is the dominant element of the vegetation in the area and the floristic richness of the area has been gradually decreased by human activities. This ethnobotanical research mainly deals with the vernacular names, cultivated plants, folk medicine and usage of the plants by local people.

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2. Material and Methods

This ethnobotanical study was carried out in the Karagüney mountain (Kırıkkale) between 1989 and 1994. The study area is located nearly in the Kırıkkale vilayet and square A4 according to Davis's grid system[7]. Therefore "Kırıkkale" and "A4" are omitted from the locality list. During the field trips to the area, plant names and other information about the plants collected were recorded through interviews with the inhabitants. The collection and identification of plants and their preparation as herbarium samples were explained in Dönmez[18]. Taxon, vernacular and family names along with locality and collection number and ethnobotanical information were given below respectively. Habitat and observations on plants were excluded for shortening the article. The order of the taxonomic list of the taxa follows Davis[7]. Voucher samples were deposited in HUB.

THE TAXA INVESTIGATED

Ranunculus arvensis L. (*Pıtrak*). Ranunculaceae

Between Sulakyurt and Akkuyu village, 800 m, 8. 4. 1989, *AAD* 1032. Weedy plants.

Sinapis arvensis L. (*Hardal*). Brassicaceae

Sulakyurt, Yeşilyazı village, 950 m, 8. 4. 1989, *AAD* 1045.

Its fresh leaves are used as vegetable and it is weedy for wheat, cicer and lentil fields.

Sisymbrium altissimum L. (*Süpürgeotu*). Brassicaceae

Between Sulakyurt and Akkuyu village, 950 m, 8. 4. 1989, *AAD* 1077.

The whole plant is used for making broom.

Portulaca oleracea L. (*Soğukluk*). Portulacaceae

Koçubaba town, 1200 m, 28. 7. 1990, *AAD* 2725.

Stem and leaves are eaten and the plants are weedy in gardens.

Polygonum bistorta L. subsp. **bistorta** (*Oğlakotu*). Polygonaceae

Sulakyurt, around the city, 800 m, 19. 8. 1990, *AAD* 2821. The whole plant is used for making broom and it is weedy in crop fields. Also the plant is used as diuretic.

P. cognatum Meissn. (*Madımak*).

Koçubaba town, 1200 m, 30. 4. 1989, *AAD* 1398. Stem and leaves are eaten.

Rumex acetosella L. (*Kuzukulağı*). Polygonaceae

Ambardere village, 1100 m, 2. 6. 1990, *AAD* 2307. Fresh basal leaves are eaten.

R. conglomeratus Murray (*Efelik*).

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1523.

Fresh leaves are used for preparing food called "sarma".

Chenopodium foliosum (Moench) Aschers (*Kuşüzümü*). Chenopodiaceae

Koçubaba, town, 1330 m, 25. 7. 1991, *AAD* 2123. Its fruit is edible.

C. album L. subsp. **album.** var. **album** (*Sirken*).

Koçubaba town, 1200 m, 10. 8. 1989, *AAD* 1348.

Weedy plant and Its fresh leaves are used for making bread called "*bükme*".

Kochia scoparia (L.) Schrad. (*Süpürge*). Chenopodiaceae

Koçubaba town, 1300 m, 28. 7. 1990, *AAD* 2716. Cultivated. The whole plant is used for making brush. Also young leaves and twigs are used for food.

Noaea mucronata (Forssk.) Aschers. et Schweinf. subsp. **mucronata** (*Kazandelen, Yandak*). Chenopodiaceae

Delice, between Güvendik and Kavak villages, 1000 m, 5. 8. 1990, *AAD* 2795.

The plant is weedy in wheat field.

Tamarix parviflora DC. (*Ilgın*). Tamaricaceae

Sulakyurt, Kavurgalı village, 900 m, 31. 3. 1990, *AAD* 1700.

Young branches are used for making brush.

Amaranthus retroflexus L. (*Tilkikuyruğu*). Amaranthaceae

Koçubaba town, 1350 m, 30. 8. 1991, *AAD* 3651.

Hypericum perforatum L. (*Civanperçemi*). Hypericaceae

Şarklı village, 1000 m, 23. 6. 1990, *AAD* 2558.

Malva neglecta Wallr. (*Ebegümeci, Kömeç*). Malvaceae

Sulakyurt around the city, 800 m, 25. 5. 1990, *AAD* 2085.

Stem and leaves are used for making a food and It is used for stomachache, the prepared poultice is applied on the surface of the stomach.

Geranium tuberosum L. subsp. **tuberosum** (*Tarlatopurcuğu*). Geraniaceae

Between Sulakyurt and Akkkuyu village, 950 m, 8. 4. 1989, *AAD*1049. Its tubers are eaten.

Erodium acaule (L.) Becherer et Thell. (*Kedicırnağı, Cırtlık*). Geraniaceae

Delice, Cingeyli village, 900 m, 31. 3. 1990, *AAD* 1679. Basal leaves are eaten.

Peganum harmala L. (*Üzerlik, Nazarlık*). Zygophyllaceae

Sulakyurt, Kavurgalı village, 800 m, 10. 8. 1989, *AAD* 1603.

The plant is used against bad magic.

Rhus coriaria L. (*Tetire*). Anacardiaceae

Delice, Dağobası village, 1100 m, 23. 9. 1990, *AAD* 2832.

It is used for hemorrhoids. The young stem and leaves are collected and boiled in a large pod. The person suffering from hemorrhoids sits over the heated pod and the fume is directed to anus.

Colutea cilicica Boiss. et Bal. (*Çakıldak*). Fabaceae

Delice, around the city, 850 m, 29. 4. 1989, *AAD* 1135.

Vicia cracca L. subsp. **stenophylla** Vel. (*Yılanfiği*). Fabaceae

Koçubaba town, 1150 m, 16. 6. 1990, *AAD* 1957.

V. anatolica Turrill (*Yılanfiği*).

Sulakyurt, Kavurgalı village, 700 m, 25. 5. 1990, *AAD* 2053.

V. sativa L. subsp. **nigra** (L.) Ehrh. var. **nigra** (*Fiğ*).

Hıdırşeyh village, 1000 m, 2. 6. 1990, *AAD* 2277. Fresh seeds are edible.

Lathyrus sativus L. (*Fiğ*). Fabaceae

Sulakyurt, Kalekışla village, 1000 m, 25. 5. 1990, *AAD* 2070. Fresh seeds are edible.

Trifolium pannonicum Jacq. subsp. **elongatum** (Willd.) Zoh. (*Üçgülçayırı*). Fabaceae

Hıdırşeyh village, 1000 m, 2. 6. 1990, *AAD* 2267. It is used for animal feeding.

Trigonella foenum-graecum L. (*Çemen*). Fabaceae

Koçubaba town, 1300 m, 18. 6. 1994, *AAD* 3948. Cultivated for spice and food.

Medicago sativa L. subsp. **sativa** (Yonca). Fabaceae

Koçubaba town, 1100 m, 16/6/1990, *AAD*.1912. Cultivated and the plant is used for animal feeding.

Onobrychis fallax Freyn. et Sint. (*Burçak*). Fabaceae

Delice, Hacıobası village, 800 m, 24. 6. 1990, *AAD* 2579.

The plant is used for animal feeding.

Prunus spinosa L. (*Çakaleriği*). Rosaceae

Koçubaba town, 1300 m, *AAD* 4090.

P. cocomilia Ten. var. **cocomilia** (Dağeriği).

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1540.

Its fruit is used for making "pestil". It is favoured for Its sour flavour. The pestil is also used as a food by sweetening with some sugar.

Amygdalus orientalis Miller (*Keçibademi*). Rosaceae

Şarklı village, 850 m, 25. 5. 1990, *AAD* 2122.

Rosa damascena Mill. (*Gül, Bahçegülü*). Rosaceae

Koçubaba town, 1200 m, 16. 6. 1990, *AAD* 1093.

Cultivated or escaped from cultivation. The species is used for ornamentation and Its petals are used for making jam.

R. hemisphaerica J. Herrm. (*Kuşburnu*).

Delice, around the city, 700 m, 29. 4. 1989, *AAD* 1337.

Yellow flowered native plant in the area. The plant is used for ornamentation.

Cotoneaster nummularia Fisch. et Mey. (*İtüzümü*). Rosaceae

Şarklı village, 850 m, 26. 5. 1990, *AAD* 2148. Young twigs are used for making broom.

Crataegus orientalis Pallas ex Bieb. **var. orientalis** (*Alıç*). Rosaceae

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1571. Fruit is eaten.

C. szovitsii Pojark. (*Alıç*).

Şarklı village, 850 m, 26. 5. 1990, *AAD* 2146. Fruit is eaten.

C. monogyna Jacq. subsp. **monogyna** (*Alıç*).

Delice, Cingeyli village, 1000 m, 10. 8. 1989.

Pyrus communis L. subsp. **sativa** (DC.) Hegi (*Armut, Çördük*). Rosaceae

Şarklı village, 1000 m, 23. 6. 1990, *AAD* 2552.

P. elaeagnifolia Pallas subsp. **elaeagnifolia** (*Taşarmudu, Ahlat*).

Hıdrşeyh village, 1050 m, 2. 6. 1990, *AAD* 2274.

P. elaeagnifolia Pallas subsp. **kotschyana** (Boiss.) Browicz (*Taşarmudu*).

Sulakyurt, between Yeşilyazı and Akkuyu villages, 900 m, 8. 4. 1989, *AAD* 1078.

Amelanchier rotundifolia (Lam.) Dum.-Courset. subsp. **integrifolia** (Boiss. et Hohen.) Browicz (*İtüzümü*). Rosaceae

Delice, Tokuş dağı, 1300 m, 5. 8. 1990, *AAD* 2764. Twigs are used for making broom.

Ecballium elaterium (L.) A. Rich. (*Eşekhıyarı*). Cucurbitaceae

Sulakyurt, Kavurgalı village, 750 m, 10. 8. 1989, *AAD* 1606.

The fruits of the plant are used for sinusitis.

Eryngium campestre L. var. **virens** Link (*Çakırdikeni*). Apiaceae

Delice, Dağobası village, 1250 m, 23. 9. 1990, *AAD* 2825.

Bunium microcarpum (Boiss.) Freyn subsp. **microcarpum** (*Tarlatopurcuğu, Yağlıburçak*). Apiaceae

Sulakyurt, 1000 m, 25. 5. 1990, *AAD* 2025.

Pimpinella anisum L. (*Anason, Ezentere*). Apiaceae

Koçubaba town, 1350 m, 15. 7. 1994. *AAD* 2689b.

Cultivated. The seeds of the plant are used for preparing rakı.

Berula erecta (Huds.) Coville (*Kazayağı*). Apiaceae

Koçubaba town, 1250 m, 10. 8. 1989, *AAD* 1520. The plant is eaten in the winter.

Xanthium strumarium L. subsp. **strumarium** (*Devedikeni*). Asteraceae

Delice, between Kavak and Cingeyli village, 700 m, 17. 8. 1993, *AAD* 3941.

Helianthemum tuberosus L. (*Yerelması*). Asteraceae

Koçubaba town, 1200 m, 23. 9. 1990, *AAD* 2829.

Cultivated for its edible tubers and it is used for ornamentation.

Calendula arvensis L. (*Bahçegülü*). Asteraceae

Balışeyh, around the city, 17. 9. 1993, *AAD* 4028. Cultivated.

Cosmos bipinnatus Cav. (*Bahçegülü*). Asteraceae

Koçubaba town, garden, 1300 m, 26. 7. 1990, *AAD* 3187.

Cultivated. The plant is frquently escaped from cultivation.

Tagetes erecta L. (*Topkadife*). Asteraceae

Balışeyh, around the city, 750 m, 17. 10. 1994, *AAD* 4027. Cultivated.

Anthemis kotschyana Boiss. var. **kotschyana** (*Papatya, Papacca*). Asteraceae

Koçubaba town, 1250 m, 10. 8. 1989, *AAD* 1457.

Achillea wilhelmsii C. Koch (*Eşekotu*). Asteraceae

Delice, around the city, 700 m, 18. 5. 1990, *AAD* 1681.

A. setacea Waldst. et Kit. (*Eşekotu*). Asteraceae

Sulakyurt, Yeşilyazı village, 900 m, 10. 8. 1989, *AAD* 1568.

Cirsium vulgare (Savi) Ten. (*Köygöçüren*). Asteraceae

Koçubaba town, 1200 m, 10. 8. 1994, *AAD* 4140.

Weedy plants in the field. They prefer wet and nutriently rich soils.

C. arvense (L.) Scop. subsp. **vestItum** (Wimmer et Grab.) Petrak. (*Kangaldikeni*). Asteraceae

Koçubaba town, 1200 m, 10. 8. 1994, *AAD* 1573.

Onopordum turcicum Danin (*Kangaldikeni*). Asteraceae

Koçubaba town, 1300 m, 28. 7. 1994, *AAD* 4110.

After pealing the bark of the stem the vascular cylinder is wholly eaten.

Echinops orientalis Trautv. (*Gökbaş*). Asteraceae

Koçubaba town, 1250 m, 10. 8. 1989, *AAD* 1511.

Flowers are removed from the inflorescence and the central part is eaten.

Cichorium intybus L. (*Çargı*). Asteraceae

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1543.

Tragopogon coloratus C. A. Meyer (*Yemlik, Katıryemliği, Katırtırnağı*). Asteraceae

Delice, between İmirli and Cingeyli villages, 920 m, 17. 6. 1990, *AAD* 2397.

Fresh leaves are eaten.

Scorzonera suberosa C. Koch subsp. **suberosa** (*Kıvrım*). Asteraceae

Between Sulakyurt and Akkuyu village, 950 m, 8. 4. 1989, *AAD* 1090. Its tubers are eaten.

S. mollis Bieb. subsp. **mollis** (*Kıllıtekircen, Tekircen*).

Sulakyurt, Özdere plantation area, 1100 m, 12. 5. 1990, *AAD* 1763.

Hieracium pannosum Boiss. (*Kurtkulağı*). Asteraceae

Koçubaba town, 1250 m, 10. 8. 1989, *AAD* 1451.

The stem is cut off from the top of the tuber. Next day, the leaking milk dries and collected to chew to pass the kidney stones.

Taraxacum serotinum (Waldst. et Kit.) Pioret (*Yemlik*). Asteraceae

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1517. Fresh basal leaves are eaten.

Fraxinus angustifolia Vahl subsp. **angustifolia** (*Dişbudak*). Oleaceae

Balışeyh, around the city, 700 m, 17. 10. 1993, *AAD* 4023. Cultivated for ornamentation.

Jasminum fruticans L. (*Boruk*). Oleaceae

Delice, 750 m, 29. 4. 1989, *AAD* 1209.

Convolvulus assyricus Griseb. (*Sıcakekmek*). Convolvulaceae

Çankırı: Irmakkaralısı, 800 m, 31. 3. 1990, *AAD* 1704. Fresh leaves are eaten.

C. arvensis L. (*Sarmaşık*).

Sulakyurt, Sarıkızlı village, 1000 m, 17. 6. 1990, *AAD* 2468.

Ipomoea purpurea (L.) Roth (*Bahçesarmaşığı*). Convolvulaceae

Sulakyurt, around the city, 800 m, 19. 8. 1990, *AAD* 2814.

Cuscuta palaestina Boiss. subsp. **balansae** (Yuncker) Pilltm. (*Bostanbozan*). Cuscutaceae

Sulakyurt, Ağaylı village, 1000 m, 17. 6. 1990, *AAD* 2481.

C. monogyna Vahl subsp. **monogyna** (*Kızılayrık*).

Delice, Kavak village, 1000 m, 5. 8. 1990, *AAD* 1782.

This species lives on the *Vitis vinifera* parasitically. It has been a serious problem for vine-growers. It also grows in the *Quercus* scrub.

Verbascum wiedemannianum Fisch. et Mey. (*Sığırkuyruğu*). Scrophulariaceae

Delice, İmirli village, 920 m, 3. 6. 1990, *AAD* 2378.

V. cheiranthifolium Boiss. var. **cheiranthifolium** (*Sığırkuyruğu*).

Delice, Dağobası village, 1100 m, 23. 9. 1990, *AAD* 2831.

The plant is used for making broom.

V. cheiranthifolium Boiss. var. **asperulum** (Boiss.) Murb. (*Sığırkuyruğu*).

Büyükyağlı town, 900 m, 17. 8. 1993, *AAD* 3915. The plant is used for making broom.

Galium spurium L. subsp. **spurium** (*Dilkanadan*). Rubiaceae

Koçubaba town, 1100 m, *AAD* 16. 61990, *AAD* 1917.

Orobanche nana Noe ex G. Beck (*Veremotu*). Orobanchaceae

Şarklı village, 800 m, 26. 5. 1990, *AAD* 2123.

The plant grows in gardens and it is harmful to cultivated plants.

Teucrium polium L. (*Periyavşanı*). Lamiaceae

Sulakyurt, Faraşlı village, 1100 m, 10. 8. 1989, *AAD* 1468.

It is used for vomiting to pass stomachache. It is either used for preparing herbal tea or small parts are swallowed by the people suffering from stomachache.

Wiedemannia orientalis Fisch. et Mey. (*Sormukgülü*). Lamiaceae

Delice, Alişeyhli village, 850 m, 3. 6. 1990. *AAD* 2319.

Weedy in crop fields. Floral nectar is sucked.

Satureja hortensis L. (*Feslikan, Fesleğen*). Lamiaceae

Sulakyurt, Yeşilyazı village, 800 m, 10. 8. 1990, *AAD* 1597.

Thymus sipyleus Boiss. subsp. **sipyleus** var. **sipyleus** (*Kekik*). Lamiaceae

Koçubaba town, 1350 m, 10. 8. 1989, *AAD* 1477. It is used as spice and herbal tea.

T. praecox Opiz subsp. **skorpilii** (Velen.) Jalas var. **skorpilii** (*Kekik*).

Şarklı village, 850 m, 26. 5. 1990, *AAD* 2136. It is used as spice and herbal tea.

T. longicaulis C. Presl subsp. **longicaulis** var. **subisophyllus** (Borbas) Jalas (*Kekik*).

Delice, between İmirli-Cingeyli villages, 950 m, 3. 6. 1990, *AAD* 2400.

It is used as spice and herbal tea.

Mentha spicata L. subsp. **tomentosa** (Briq.) Harley (*Nane, Narpız*). Lamiaceae

Koçubaba town, 1100 m, 29. 4. 1989, *AAD* 1342.

The plant is used as spice. It grows in wet places and it is cultivated in gardens.

Salvia viridis L. (*Tosbağaotu*). Lamiaceae

Çankırı: Irmakkaralısı, 1000 m, 31. 3. 1990, *AAD* 1711.

Aristolochia maurorum L. (*Kargabödeleği*). Aristolochiaceae

Sulakyurt, Yeşilyazı village, 950 m, 8/4/1989, *AAD*.1038.

Urtica dioica L. (*Isırgan, Isırgı*). Urticaceae

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1545.

Stem and leaves are used as food and for the treatment of rheumatic pains.

Quercus ithaburesis Decne. subsp. **macrolepis** (Kotschy.) Hedge et Yalt. (*Palamutmeşesi*). Fagaceae

Delice, Büyükavşar town, 900 m, 3. 6. 1990, *AAD* 1315. The fruit is eaten.

Salix alba L. (*Karasöğüt*). Salicaceae

Sulakyurt, Akkuyu village, 950 m, 8. 4. 1989, *AAD* 1057.

Young branches of the tree are used for making basket.

S. babylonica L. (*Salkımsöğüt*).

Koçubaba town, 1250 m, 10. 9. 1994, *AAD* 4239. Cultivated for ornamentation.

Muscari comosum (L.) Miller (*Arapsümbülü*). Liliaceae

Sulakyurt, around the city, 820 m, 25. 5. 1990, *AAD* 2083.

Merendera sobolifera L. C. A. Meyer (*Koyungöğsü, Koyungözü*). Liliaceae

Delice, Büyükavşar town, 1200 m, 2. 5. 1990, *AAD* 2645.

Hyacinthella micrantha (Boiss.) Chouard (*Sümbül*). Liliaceae

Delice, Cingeyli village, 900 m, 31. 3. 1990, AD.1674.

Colchicum triphyllum G. Kunze (*Koyungöğsü, Öksüzoğlak*). Liliaceae

Delice, Büyükavşar town, 1200 m, 2. 5. 1990, *AAD* 1643.

Iris caucasica Hoffm. subsp. **caucasica** (*Navruz, Sultannavruz*). Iridaceae

Sulakyurt, Faraşlı village, 1100 m, 23. 4. 1990, *AAD* 1749.

Crocus ancyrensis (Herbert) Maw (*Çiğdem*). Iridaceae

Deredüzü village, 1100 m, 18. 3. 1990, *AAD* 1665. The corm is eaten.

C. danfordiae Maw (*Çiğdem*).

Aşağıkaraksık village, 1250 m, 25. 3. 1989, *AAD* 1013. The corm is eaten.

Catabrosa aquatica (L.) P. Beauv (*Çipil*). Poaceae

Sulakyurt, Kalekışla village, 25. 5. 1990, *AAD* 1063. Cultivated for animal feeding.

Stipa arabica Trin. et Rupr. (*Buzağılık*). Poaceae

Şarklı village, 900 m, 26. 5. 1990, *AAD* 2153.

Phragmites australis (Cav.) Trin ex Stedeudel (*Kamış*). Poaceae

Koçubaba town, 1100 m, 10. 8. 1989, *AAD* 1533.

Cynodon dactylon (L.) Pers. var. **villosus** Regel (*Ayrık*). Poaceae

Sulakyurt, Kavurgalı village, 800 m, 10. 8. 1989, *AAD* 1607.

3. Results

In this article, 100 taxa with their vernacular names are given. It has been recorded that 14 of these vernacular names are used for two or more taxa. On the other hand, 18 taxa have two or more names. Only 6 taxa were recorded to be used in folk medicine while 10 taxa were recorded to be cultivated. In addition, 30 taxa are gathered from nature for food. 4 taxa are used for animal feeding. 9 taxa are recorded as weedy plants. 5 taxa, woody plants or herbs, are used for ornamentation. Lastly, 11 taxa are used for other purposes not mentioned above, as spice, timber, fire, hedge and etc. The results were summarised in Table 1.

Table 1. Ethnobotanical peculiarities of the Karagüney (Kırıkkale) mountain.

Taxa	Total verra-cular ames	Names used for different taxa	The taxa having two or more names	Plants used in folk medicine	Culti-vated plants	Plants collected from nature for food	Plants used for animal feeding	Orna-metal plants	Weedy plants	Plants used for other purposes
100	105	14	18	6	10	30	4	5	9	11

The plants are given under the 10 groups, based on folkloric information. But, some plants are present in more than one group. For example, *Prunus cocomilia* is used for its fruit but its wood is also used for fire.

Some plants were used for dying, but there is any person who is interested in dying. Socio-economical developments in the area were changed the interaction between the people and nature. Unhappily, the plants and uses of them for dying are not known by the actually living people in the area.

An increase in human population and the decrease of soil fertility have been resulted in the migration of people to other cities. The interest of the local people in the nature has been decreasing. On the other hand, the inhabitants prefer contemporary medicine. As a result, ethnobotanical culture has lost its importance before it is known by scientist.

Vural et al.,[17] report some plant names and ethnobotanical information on the Kırşehir region, near to Kırıkkale. As compared with our results, there are similarities between two region Kırşehir and Kırıkkale, by vernacular names, and other ethnobotanical features.

Acknowledgement: Plant names and folkloric information were obtained mainly from Fadime Dönmez, Bayram Coşkun and Hakkı Ulusoy. I would like to thank them and other people whose name could not given here.

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Hacettepe Bulletin of Natural Sciences and Engineering
Series A, 28 (2000), 33-38

THE SPAWN DEVELOPMENT IN *Agaricus bitorquis* (Quél.) Sacc. MYCELIUM GERMINATED AT DIFFERENT TEMPERATURES*

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Received 14.02.2000

Abstract

Agaricus bitorquis (Quél.) Sacc. basidiocarps collected from nature were grouped as A,B,C,D. The seconder mycelium was obtained by the development of primer mycelium at 25°C, 28°C, 30°C, 32°C, 35°C and 38°C. The spawn was prepared from the seconder mycelium developed at different temperatures . In the development of spawn; as the mycelium began to develop, the shaking time, the mycelium covering the wheat grains completely and the period of incubation were taken as criteria.

Key Words *Agaricus bitorquis*, spawn, development of vegetative mycelium

1. Introduction

The seconder mycelia of mushrooms are generally referred to as spawn. Spawn is a pure culture of a mycelium growing on a solid substrate such as cereal grains (1-6). Grain spawn was invented by Sinden in 1931 (7). In 1932 Sinden patented a new spawn making process using cereal grain as the mycelial carrier. Since then rye has been the most common grain employed although millet, milo and wheat have also been used (8). When compared with manure spawn, the grains with the mycelium on the surface offer the advantage that the spawn can readily be mixed evenly throughout the compost. The most widely used grains are rye and millet, while success has also been reported with wheat and sorghum (2,6,9). Small grains such as millet, give a greater number of inoculation points per liter than large grains such as rye (2). Therefore those who use millet claim it makes better spawn (9). Spawn is usually prepared with wheat in Türkiye because of wheat was grown very common in the country (3,4). In preparing grain spawn, it is important to consider carefully both the origin and strain of the grain to be used. The mycelium chosen for spawn production must be of first class quality, that it must be healthy and show no signs of degeneration (2). This papers reports the development of spawn prepared from *Agaricus bitorquis* (Quél.) Sacc. mycelium germinated at different temperatures.

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* Bu çalışma Perihan Güler'in doktora tezinin bir bölümüdür.

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2. Material and Methods

A- Used Organism

In this study, *Agaricus bitorquis* basidiocarps collected from Aşağı Hacıosmanoğlu village (Polath,Ankara) in May 1995 were used. The collected mushrooms were grouped as 20 groups previously. The basidiospores of these groups were germinated on the wheat agar in the petri dishes and they were incubated for 20 days. At the end of the periods, the best developed 10 groups were taken for development of mycelium. The mycelial agar discs were taken from these groups and they were inoculated on the wheat agar. At the end of the incubation periods of 20 days, the mycelium were developed as rhizomorphic and healty at the 4 groups and these were grouped as A,B,C,D. The fructifications were dried after taking spores in sterile inoculation cabin. They were kept in the refrigerator at +4°C in the paper bags.

B- The Preparation of Agarmedia

In the study, the wheat agar was used (3,10). For preparing wheat agar, 125 g wheat was boiled for 2 hours in 4 liters distilled water and it was kept for 24 hours in the water. After filtering the liquid part and 4 liters distilled water was added. It was heated until the boiling point after adding 2% agar. They were filled in the erlenmeyers of 500 cc before freezing. The erlenmeyers were closed by cotton and the aluminium paper. They were sterilized for 15 minutes at 120°C temperature in autoclave and poured into sterile petri dishes and then cooled (3).

C- The Preparation of the Main Culture

The basidiospores of A,B,C,D groups were germinated by multispore method (3,11-13) in the agar and primer mycelium obtained. The mycelial agar discs were taken from primer mycelium and transferred to wheat agar into the petri dishes. They were developed at 25°C, 28°C, 30°C, 32°C, 35°C and 38°C temperatures and seconder mycelium were obtained. For a healthy and productive study mycelium transfers were made in each 15 days. For the mycelial developments, optimal temperature was pointed out as 30°C (14-17) and these developments were thought as control group. In this study, the groups were shown for example as C30. This expression shown that the mycelium of group C were developed at 30°C.

D- The Preparation of Spawn

The spawn used in this study was obtained from the covering of the wheat grain. Ten kg wheat was boiled for 20 minutes and filtered for this aim. The wheat were left to dry on a place. For the pH media, 50 gr chalk and 200 gr gypsum were added in order not to stick to each other and they were mixed altogether. They were filled in the bottles of 1 lt until 2/3 volume of it. The bottles should be resistant to temperature. They were closed with the cotton and the thick paper and sterilised in the autoclave at 125 °C for one and a half hour. They were placed in the sterile room and allowed to cool (2-6,8,18,19). Two mycelial agar discs that were taken from main cultures were put into bottles separately and then closed in the sterile inoculation cabin. They were incubated in 90-100% humidity and 28-30°C temperatures.

3. Results

The development of seconder mycelium prepared from *Agaricus bitorquis* basidiocarps were examined at different temperatures. In the group A, the development of rhizomorphic mycelium was observed at 25°C, 28°C, 30°C and 32°C. In the same way, the development of mycelium that grew parallel to the agar surface was observed at 25°C, 28°C, 30°C, 32°C and 35°C in the B,C,D groups, but the abnormal mycelium development was determined at 35°C in the B,C,D groups. In these groups the mycelium formed miscellaneous and cottony aerial hyphae. In the A group, the development of mycelium was not observed at 35°C. Therefore, the spawn was prepared in all the groups except the group A35. The

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and on the 14th day of development. In this culture, the wheat grains were completely covered by the mycelium on the 24th day of incubation.

The fastest development in the group B was seen at the spawn that improved at 32°C. In this group, the mycelium development began on the 4th day of incubation and the first shaking was on the 9th day of incubation and on the 6th day of the development. The second shaking was on the 15th day of incubation and on the 12th day of development. The mycelium development was completed on the 21st day of incubation (Table 1).

c) The development of spawn prepared from the mycelium in group C

The slowest development in the study was determined in the spawn cultures improved in the mycelium of group C except the group C30. In the group C, the mycelium development began on the 6th day of development in all the temperatures except the control group as C30.In the spawn cultures improved at 25°C the first shaking was on the 14th day of incubation and on the 9th day of the development. The second shaking was on the 21st day of incubation and on the 16th day of development. The mycelium development was completed on the 27th day of incubation.

In the spawn cultures improved at 28°C the first shaking was on the 12th day of incubation and on the 7th day of the development. The second shaking was on the 19th day of incubation and on the 14th day of development. The mycelium development was completed on the 25th day of incubation.

In the spawn cultures improved at 32°C the first shaking was on the 13th day of incubation and on the 8th day of the development. The second shaking was on the 20th day of incubation and on the 15th day of development. The mycelium development was completed on the 26th day of incubation (Table 1).

d) The development of spawn prepared from the mycelium in group D

The fastest development in the study was observed in the spawn cultures improved in the mycelium of group D. In the group D, the mycelium development began on the 4th day of development in all the temperatures. In the spawn cultures improved at 25°C the first shaking was on the 8th day of incubation and on the 5th day of the development. The second shaking was on the 14th day of incubation and on the 11th day of development. The mycelium development was completed on the 19th day of incubation.

In the spawn cultures improved at 28°C the first shaking was on the 9th day of incubation and on the 6th day of the development. The second shaking was on the 16th day of incubation and on the 13th day of development. The mycelium development was completed on the 20th day of incubation.

The slowest development in the group D was obtained in the spawn cultures improved at 32°C. In this group, the first shaking was on the 10th day of incubation and on the 7th day of the development. The second shaking was on the 17th day of incubation and on the 14th day of development. The mycelium development was completed on the 22nd day of incubation (Table 1).

Table 1. The calendar of spawn development prepared from the mycelium groups A,B,C,D.

Groups	Temp.	The incubation period (day)																									
	°C	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
	25	-	-	-	+	+	+	-	1S	-	+	-	+	2S	-	+	+	+	BK									
A	28	-	-	-	+	+	+	-	+	-	1S	-	+	-	-	-	+	2S	+	+	+	-	BK					
	30	-	-	-	-	-	+	+	1S	-	-	+	-	-	+	2S	+	+	+	+	+	BK						
	32	-	-	-	+	-	-	+	+	-	+	-	+	1S	-	+	+	+	+	2S	-	+	+	+	BK			
	25	-	-	-	-	-	-	-	+	-	+	1S	-	-	+	+	+	2S	+	+	+	+	+	BK				
	28	-	-	-	-	+	-	+	-	-	+	1S	+	-	+	+	+	-	2S	+	+	+	+	+	BK			
B	30	-	-	-	-	+	+	-	1S	+	+	+	-	+	-	2S	+	+	+	+	+	BK						
	32	-	-	-	-	+	+	-	-	1S	+	-	+	+	-	2S	+	+	+	+	BK							
	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-	-	-	-	-	+	1S	-	+	+	-	+	2S	+	+	+	-	+	BK	
	28	-	-	-	-	-	+	-	-	-	+	-	1S	+	+	-	+	+	+	2S	+	-	+	-	+	BK		
C	30	-	-	-	-	+	+	+	1S	-	-	+	+	-	-	2S	+	+	+	+	+	BK						
	32	-	-	-	-	-	+	-	+	-	-	-	+	1S	-	+	+	-	+	+	2S	+	+	+	+	-	BK	
	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	+	-	1S	+	+	+	-	-	2S	-	-	-	-	BK								
	28	-	-	-	-	-	-	+	-	1S	+	-	+	+	+	+	2S	+	-	BK								
D	30	-	-	-	+	+	+	1S	+	-	+	+	2S	+	-	+	-	+	+	BK								
	32	-	-	-	+	-	+	-	-	-	1S	-	+	-	-	-	+	2S	+	+	+	+	BK					
	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

(+) = Positive development

(-) = Negative development

1S= First shaking

2S = Second shaking

BK = Put into refrigerator

4. Discussion

In this study, the development of spawn which was prepared from *A. bitorquis* mycelium germinated at different temperatures was examined.

The mycelium of *A.bitorquis* were grouped as A,B,C,D and they were incubated at 25°C, 28°C, 30°C, 32°C, 35°C and 38°C. As a result the main cultures were obtained. The mycelium of group A was developed at 25°C, 28°C, 30°C and 32°C, but they were not developed at the 35°C and 38°C. In the same way, in the groups B,C,D, the mycelium development was observed at 25°C, 28°C, 30°C, 32°C and 35°C, but in these groups, the mycelium development was not obtained at 38°C. That is way, the thermal lethal point for the mycelium of group A was determined as 35°C. Likewise, the thermal lethal point for the mycelium of groups B,C,D was determined as 38°C. Later, the spawn was prepared from these main cultures. As shown in the Table 1, in this study, the fastest mycelium development was observed in the mycelium of group D and the slowest mycelium development was observed in the mycelium of group C. In the spawn prepared from the groups of B,C,D germinated at 35°C; the mycelium development was not obtained. Therefore, the thermal lethal point for spawn in the groups of B,C, D was determined as 35°C.

prepared culture bottles were put into the incubation room, that had the conditions of temperature between 27°C and 29°C and 80% humidity. The incubation period showed the differences according to the development in the groups. During the incubation period, the first and second shaking was made at the spesific days for the homogeneus distrubition of mycelium. Günay (1995) (3) reported that the first shaking is 10-15 days and second shaking is 20-25 days after the inoculation. In this study, the development of the spawn and the days of shaking were shown at the Table 1 which formed the development calendar of mycelium.

1. The development of mycelium in the control group

As we mentioned before for the mycelial development, optimal temperature was pointed out as 30°C (14-17) and these developments were thought as control group. In this temperature, the mycelium development began on the 4th day of the incubation in all spawn bottles. For a homogeneus development, the first shaking was on the 8th day and the second shaking was on the 15th day of the incubation. After the 21 daily incubation, the mycelium covered the wheat grains and the development was completed (Table 1).

2. The development of spawn prepared from the mycelium improved in the different temperatures

a) The development of spawn prepared from the mycelium in group A

In the group A, the development began in all the temperatures on the 4th day of incubation. The fastest spawn development was seen at the mycelium that improved at 25°C. In these cultures, the first shaking was on the 8th day of incubation and on the 5th day of the development. The second shaking was on the 13th day of incubation and on the 10th day of development. The wheat grains were completely covered by the mycelium on the 18th day of incubation. In the spawn cultures developed at 28°C, the first shaking was on the 10th day of incubation and on the 7th day of the development. The second shaking was on the 17th day of incubation and on the 14th day of development. The mycelium development was completed on the 22nd day of incubation. The slowest development in the group A was seen at the spawn that improved at 32°C. In these cultures, the development was completed on the 24th day of incubation and the first shaking was on the 13th day of incubation and on the 10th day of the development. The second shaking was on the 19th day of incubation and on the 16th day of development (Table 1).

b) The development of spawn prepared from the mycelium in group B

In the mycelium of group B; in the spawn cultures improved at 25°C and 28°C, the development began on the 5th day of incubation. In the each two groups, the first shaking was on the 11th day of incubation and on the 7th day of the development.

In the spawn cultures improved at 25°C, the second shaking was on the 17th day of incubation and on the 13th day of development. In this culture, the mycelium development was completed on the 23rd day of incubation. In the spawn cultures improved at 28°C, the second shaking was on the 18th day of incubation

Hacettepe Bulletin of Natural Sciences and Engineering
Series A, 28 (2000), 39-43

NEW ADDITIONS TO TURKISH ENTOLOMATACEAE

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Received 22.03.2000

Abstract

Entoloma incanum (Fr.) Hes., *Entoloma sericellum* (Fr.: Fr.) Kumm. and *Entoloma sericeoides* (Lge.) Noordel. were recorded for the first time from Turkey. Previously recorded *Entoloma* species were reviewed with their distribution in Turkey.

Key Words: New records, *Entolomataceae*, Turkish Mycoflora

Introduction

Turkey has a very rich flora and many studies were carried out, starting especially from 1930's, on macrofungi. These studies were given in a list by Baytop (1) and by Baytop and Mat (2). But there is still much to be done. Because macrofungi of many provinces haven't been determined yet.

Likewise, although *Entoloma* is a large genus in *Entolomataceae* family, we have found very few records, belonging to this genus, from Turkey. The previously recorded *Entoloma* species, their collection sites, collection dates, and collectors are given in Table 1. In this study three new *Entoloma* species were added to the Turkish *Entolomataceae* for the first time.

Table 1. Turkish *Entoloma* species: collection sites, collectors and collection dates

Species	Collection Site	References
Entoloma clypeatum	İstanbul	Lohwag, 1957
Entoloma sinuatum	İstanbul	Lohwag, 1957
	Muğla	Işıloğlu & Öder, 1995
Entoloma hirtipes	Konya	Afyon, 1997
Entoloma undatum	Bitlis	Kaya & Öztürk, 1999

Materials and Methods

The study material was collected during our routine field trips in 1998 in Bitlis Province (Fig. 1). Necessary morphological and ecological features of the macrofungi were noted and coloured photographs were taken in their natural habitats at the collection site.

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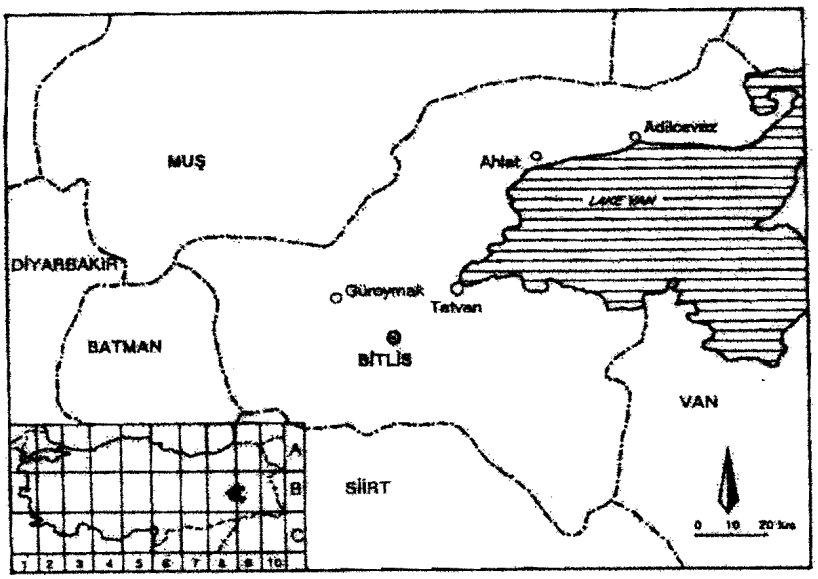

Fig. 1. Macrofungi collecting sites

After the specimens were brought into the laboratory, their macroscopic and microscopic properties were investigated and they were identified by comparing the obtained data with the taxonomic characteristics given in Moser (3), Breitenbach & Kranzlin (4) and Jordan (5).

The macrofungi samples are kept in the Herbarium of Yüzüncü Yıl University (VANF), Van, Turkey.

Results

Entoloma incanum (Fr.) Hes.

Rhodophyllus euchlorus (Lasch: Fr.) Quél.

Agaricus carneovirescens Jungh.

Leptonia incana (Fr.) Gillet

Rhodophyllus incanus (Fr.) Kühn. & Romagn.

Pileus 15-40 mm across, hemispherical to convex when young, later planoconvex to broadly convex with a depressed center, some old samples irregularly undulating, surface smooth, satiny, olive-green to olive-brown, more or less lighter toward the margin, dark green squamulose at the center, margin acute, incurved when young in some samples, sometimes split when old. Flesh thin, greenish, taste mild, not distinctive, odor like mouse urine or burnt corn. Lamellae greenish-white when young, later pale pink to greenish-yellow, sometimes bulish tinted in age, broad, edges smooth, adnate to subdecurrent (Fig. 2.a).

Stipe 25-50 x 1.5-4 mm, cylindrical to compressed with a longitudinal grove, hollow, fragile, surface smooth, bright yellow-green when young, later bluish-yellow, white tomentose at the base.

Spores 10-13.5 x 8-10 µm, 6-9 angled (Fig. 2.b), spore print reddish ocher. Basidia 30-40 x 10-15 µm, clavate to ventricose with 2,3 or 4 sterigmata without basal clamp (Fig. 2.c). Cystidal structure absent. Paraphysis of periclinal hyphae 3-7 µm across.

Entoloma incanum grows inside and outside forests, gardens, in wet meadows, among mosses on moist soil, also on calcareous soil as solitary to gregarious.

Specimen examined: Bitlis: In poplar grove, on wet ground, May 16 1998, K. 292.

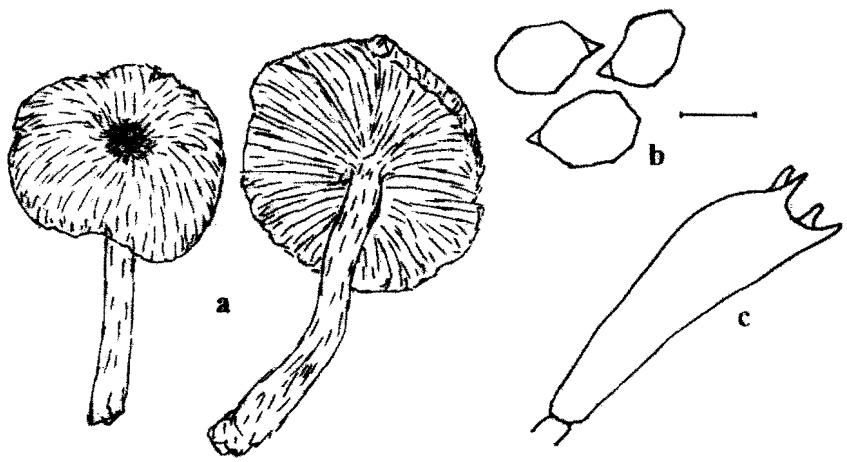

Figure 2. *Entoloma incanum*: a. fruiting body (life size), b. spores, c. basidium. Scale bar 10 µm.

Entoloma sericellum (Fr.: Fr.) Kumm.

Rhodophyllus carneoalbus (With.) Quél.

Pileus 10-20 mm across, hemispherical when young, then convex to conic-campanulate, later plane and indented, surface smooth, finely radially fibrillose, white when young later pale ocherish or yellowish, more or less darker at the center, margin acute, undulating especially in old samples (Fig. 3.a). Flesh thin, white, taste mild, not distinctive, odorless. Lamellae white when young, later pink, broad, edges undulating, adnate to subdecurrent.

Stipe 15-30 x 1.5-3 mm, cylindrical, solid when young, hollow when old, surface smooth, white at first, yellowish in age or after collection.

Spores 9-12 x 6.5-9 µm, 5-8 angled (Fig. 3.b), spore print pink ocher. Basidia 35-40 x 10-13 µm, clavate with 4 sterigmata and basal clamp (Fig. 3.c). Cheilocystidia 25-60 x 3-12 µm, more or less cylindrical. Paraphysis of periclinal hyphae 5-15 µm across.

Entoloma sericellum grows inside and outside forest, in wet meadows, poor meadows as solitary or gregarious.

Specimen examined: Bitlis: Adilcevaz, Göldüzü village, in wet meadow as solitary, May 22 1998, K. 385.

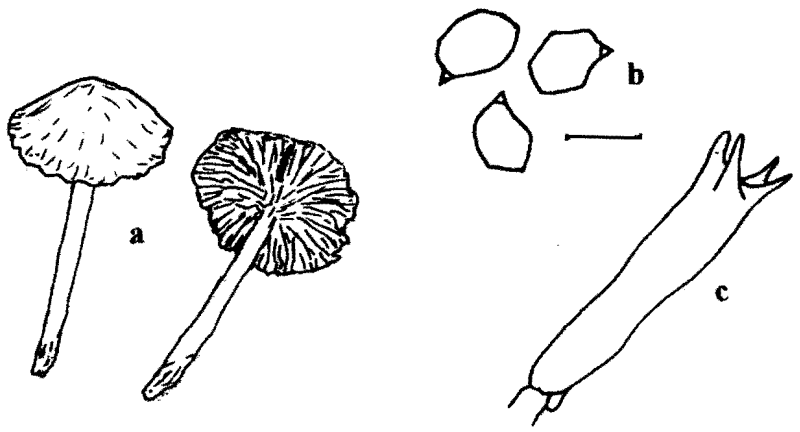

Figure 3.*Entoloma sericellum*: a. fruiting body (life size), b. spores, c. basidium. Scale bar 10 µm.

Entoloma sericeoides (Lge.) Noordel.

Pileus 20-40 mm across, convex when young, then plane and undulating, center indented, surface smooth when young, later slightly radially wrinkled to striated (Fig. 4.a), dark-brown when moist, brown when dry, margin acute, incurved when young for a long time. Flesh thin,

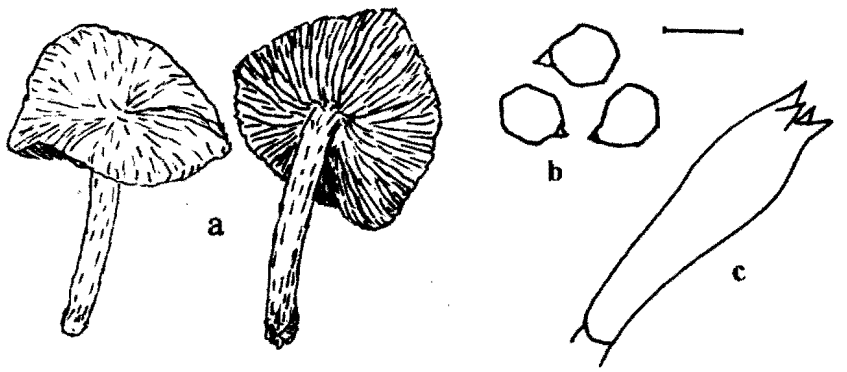

Figure 4. *Entoloma sericeoides*: a. fruiting body (3/4 life size), b. spores, c. basidium. Scale bar 10 µm.

whitish to light brown, taste and odor mild and farinaceous. Lamellae whitish to cream-colored when young, pink brown when old, broad, adnate.

Stipe 20-45 x 3-7.5 mm, cylindrical to compressed, sometimes with longitudinally grove, solid when young, hollow when old, fragile, surface brown, sometimes longitudinally fibrillose, white tomentose at the base.

Spore 7.5-9.5 x 6.5-8.5 µm, 5-6 angled (Fig. 4.b), spore print red-brown. Basidia 35-40 x 10-12 µm, clavate, with 4 sterigmata, without basal clamp (Fig. 4.c). Cystidal structure absent. Paraphysis of periclinal hyphae 3-9 µm across.

Entoloma sericeoides grows in poor meadows, pastureland, on calcareous and sandy dry soils in mild locations, usually as gregarious.

Specimen examined: Bitlis: Adilcevaz, in wet meadow, 21 May 1998, K. 378.

Discussions

In this study *Entoloma incanum, E. sericellum* and *E. sericeoides (Entolomataceae)* are recorded for the first time from Turkey.

The genus *Entoloma* is a large genus with almost hundred of members in some European countries. But very few species of this genus were recorded from Turkey. With the studies carried out by Lohwag (6), Işıloğlu and Öder (7), Afyon (8) and Kaya and Öztürk (9), *Entoloma clypeatum* (L.:Fr.) Kumm., *E. sinuatum* (Bull. ex Pers.: Fr.) Kumm., *E. hirtipes* (Schum.: Fr.) Mos. and *E. undatum* (Fr.) Mos. have been collected up to now. With future studies which are to be carried out especially at unstudied provinces, this scarcity will probably be overcome and new *Entoloma* species will be added to the Macrofungal Flora of Turkey.

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Hacettepe Bulletin of Natural Sciences and Engineering
Series A, 28 (2000), 44-56

AN ANATOMIC ANALYSIS OF THE EXTENT OF COMPATIBILITY IN THE PISTACHIO SEEDLINGS BUDDED IN DIFFERENT PERIODS

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Received 05.04.2000

Abstract

This research aims to make an anatomic analysis of the extent of compatibility in the budded parts of the cross sections taken from *P. vera* seedlings which are T-budded in the spring and autumn budding periods. It is derived that, in all patterned after the budding period, compatibility in the buddings that are done in the spring budding period is much quicker and healthier when compared to the buddings in the autumn budding period.

Key Words : Pistachio, budding, anatomical observation

1. Introduction

Compared to the other growing techniques, budding in pistachio raising leads to more successful results and gains importance due to its suitability to pistachio- specific raising techniques (1). However, compared to the other fruit species, the process of budding in this species implies greater care and attention concerning the time and the technique of the budding (1,2).

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In the studies produced by many researchers about pistachio budding, the best time for budding and the methods for the most successful budding are mentioned (3, 4, 5, 6, 7). Although varying with the place and the year, in the regions where pistachio raising is practiced, the most appropriate time for pistachio budding in general is reported as the spring budding period beginning from the mid of May till the end of June. Whereas, during the autumn budding period, which lasts till the end of August and mid of September, it is quite hard to remove the bark from the stock, the process of budding gets much more difficult and the success of budding fails. In addition, due to its considerable success and its ease in practise, the use of budding is suggested (1, 2, 3, 4, 5, 6, 7). In our country, T-budding is widely practised in pistachio raising, leading to successful results (1, 2, 8, 9, 10).

Besides the appropriate time and technique for budding, some other factors like the careful practice of the budding concerning its technique, maintenance tasks also have important roles in the success of budding. In addition, the cambial relations between the stock and the scion emerge as an important stage in the success of budding and in obtaining a healthy budded sampling (11, 12, 13, 14, 15).

In our study, considering the *P. vera* seedlings that are budded in different periods, the anatomic structure in the budded parts is analysed and the impacts of those different budding periods on the cambial activity, which affects the success of budding, are explored.

2. Material and Methods

The research is carried out in Gaziantep, a province with a highly considerable status regarding pistachio raising, in the conditions provided by Pistachio Research Institute.

As the stock, *Pistacia vera* L. seedlings are employed due to their stock characteristics and their importance for producing more lateral roots compared to other species. Budding scions are taken from the Siirt cultivar, which has lower susceptibility to periodicity and higher fruit quality.

P. vera seedlings, which were produced by planting seeds in the 20x50 cm. black plastic bags using 1/3 thiny sand + 1/3 burned barn fertilizer + 1/3 sieved sand, are budded when they reached to the optimum thickness needed for budding. The process of budding was practised in the spring (at the beginning of June) and in the autumn (at the end of August) budding periods and T-budding was employed as the budding technique (1, 2).

On the 7^{th}, 14^{th}, 21^{th} and 28^{th} days after the process of budding, a sample of 15 seedlings was randomly selected from each budding period and the seedling, which was cut in a way leaving 3 cm. below and above the budded parts, was fixed in FAA solution (15). The cross sections with 50 μ thickness that were obtained by a hand microtone were stained by safranin and fast green double technique, and the extent of compatibility of the tissues was analyzed.

3. Results and Discussion

When an analysis of the sections which are taken from the bud joint points of *Pistacia vera* L. seedlings that are budded in spring budding period is made, it is observed that there occurs an increase in parenchymatic cells in the budded part during the first two weeks (7^{th} and 14^{th} days) following the budding and that the new callus cells are just beginning to appear whereas the formation of callus bond in the budded part is not complete (Figure 1, 2).

It is known that budding has four stages for a budded part to heal. These are; the combination of the budding elements from the cambial regions, the formation of the callus bond by the mutual appearance of the parenchymatic cells, to provide the cambial continuity and to make new phloem and xylem tissues appear from the new cambial tissue (11).

In our study, the initial ones of those main stages were observed to occur during the first two weeks following the spring budding.

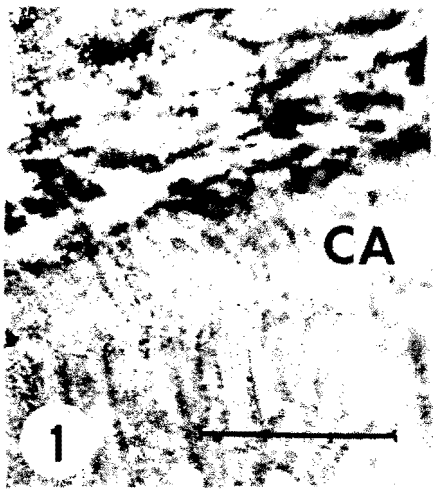

Figure 1. The newly formed callus cells in the budded part in the cross sections taken 7 days after the budding from the budded part of *P. vera* seedlings T-budded in the spring budding period.
Bar: 200μm (CA – Callus)

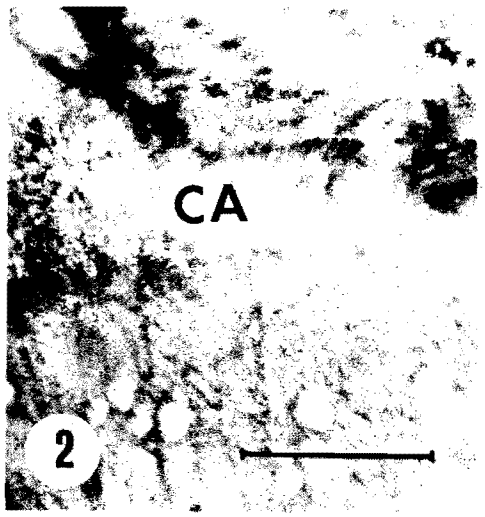

Figure 2. The newly formed callus cells in the budded part in the cross sections taken 14 days after the budding from the budded part of *P. vera* seedlings T-budded in the spring budding period.
Bar: 200μm (CA – Callus)

In the cross sections taken in the third week (21st day) after the budding, it was found that in the majority of the bud joint points, the cambial relation between the stock and scion had been established (Figure 3A). The intensity of the cambial relation between the stock and scion was not the same in all joint surfaces. Especially in the edge regions where the stock and scion tissues join, a more active growth of the callus tissue was observed.

In the surface where the mid surface of budded part joins with the stock, the establishment of the cambial relation took much more time compared to that one in the edge regions. Besides these, it was realized that new xylem elements had already formed (Figure 3B).

Figure 3. In the cross sections taken 21 days after the budding from the budded parts of *P. vera* L. seedlings T-budded in the spring budding period A) curvilinearly established cambial continuity in the budded part B) callus cells and differentiated new xylem elements
Bar : 200μm (NC - New Cambium, CA - Callus, Ca - Cambium, Xy - Xylem)

In the cross sections taken in the fourth week (28th day) after the budding, it was found that in all surfaces of the budding elements, the cambial relation had been established (Figure 4).

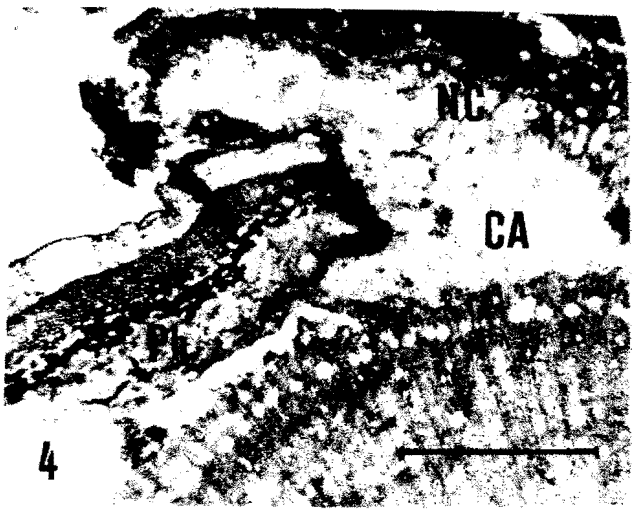

Figure 4. In the cross sections taken 28 days after the budding from the budded parts of *P. vera* L. seedlings T-budded in the spring budding period, cambial and vascular relation established on the callus bond in the budded part

Bar : 200 μm (CA - Callus, NC - New Cambium, Ph - Phloem)

In the cross sections that were taken from the budded parts of P. vera L. seedlings budded in autumn budding period, the callus formation between the stock and budded surfaces could be observed only in the sections taken in the second week (14^{th} day) (Figure 5). In the sections taken in first week (7^{th} day) after the budding, any cellular activity was not reported.

Figure 5. In the cross sections taken 14 days after the budding from the budded part of *P. vera* L. seedlings T-budded in the autumn budding period, the newly formed callus cells.
Bar : 200μm (CA - Callus, Ca - Cambium, Xy - Xylem, Ph -Phloem)

In the seedlings budded in the autumn budding period, the formation of the callus stratum between the stock and budded surfaces could be observed in the sections taken in the third (21st day) and fourth (28th day) weeks (Figures 6 A and B, Figure 7).

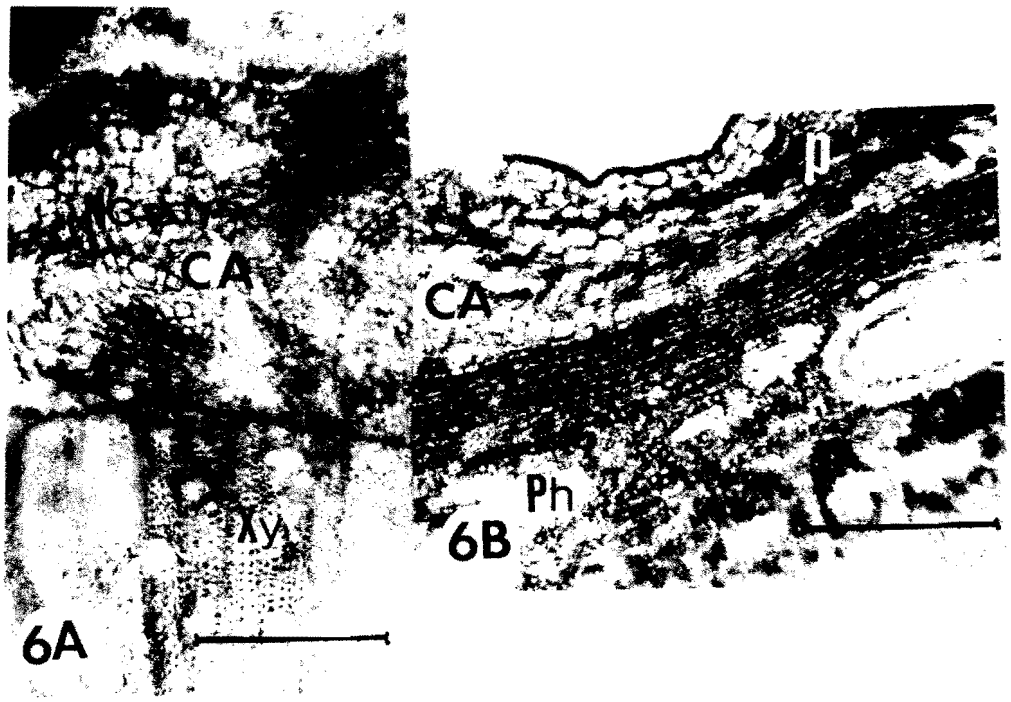

Figure 6. In the sections taken 21 days after the budding from the budded parts of *P. vera* L. seedlings T-budded in the autumn budding period, A) callus tissue formed by budding elements B) the newly formed phellogen (P) strata.

Bar : 200µm (CA - Callus, NC - New Cambium, Xy - Xylem, Ph - Phloem, P - Phellogen)

Figure 7. Cambial relation established in the budded part in the sections taken 28 days after the budding from the budded parts of *P. vera* L. seedlings T-budded in the autumn budding period,
Bar : 200 μm (CA - Callus, Ca - Cambium, Xy - Xylem, Ph - Phloem)

It was found out that the cambial relation among the budding elements was established earlier in the seedlings that are budded in the spring budding period. Concerning the budding in both periods, new xylem differentiation was much more seen in the stock of the budded parts. While the callus bond between the stock and budded part was linear through the section, it was curvilinear at the points of congruency of the stock and budded part. It is seen that our findings above are similar with those of Balta et al. (15).

When the budding periods were compared, it was reported that, in the seedlings budded in the spring period the cambial bond among the budding elements had been established earlier than the one in the autumn

budding period and the activity in the cambium strata occurs in a wider surface as well.

Likewise in their studies about pistachio, Ibrahim and Nahlawi (3, 4), Needs and Alexander (5), Nahlawi et al. (6), Mamedov (7) and Kuru et al. (8) mention that the budding in the spring budding period leads to more successful results, the success of budding is achieved quicker and growth of the branch begins earlier when compared to those in the autumn budding period.

Especially in the spring period, the compatibility in the budded part is completed in a cellular level in the first three weeks. A similar case is reported by Balta et al. (15, 16) who mention that in the sections taken 25 days after the budding, in the majority of the bud joint points, cambial relations between the stock and the scion had been established. Besides, Kuru et al. (8) and Ozbek (17) mentioned that the success of the budding can also be understood by naked eye considering certain criteria like checking the wrinkle and the colour of the bark in the budded part approximately 20 days after the budding.

Also, in our study, it was found out that anatomically, the compatibility in the budded part had been established in the first three weeks after the budding. Furthermore, another finding indicates that when compared to autumn period, compatibility in spring budding period occurs much quicker. This condition can be explained by the cell division that provides the cambial activity –which consists of the main stages for the compatibility of budding elements- and the effect of the heat on the formation of activities.

Whereas the temperature is more appropriate for cell activation in the spring periods including June, in the autumn periods including August and September, due to the high temperature, cell activity gets slower in the regions where pistachio raising is practised. This approach is consistent with

the findings of researchers who report the difficulty in removing the bark from the stock and in the budding process, and the low success rate of budding in the buddings during August and September when the temperature is quite high (8, 17, 18).

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