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Host Range and the Distribution of the Powdery Mildews in Turkey

Yüksel Kâzım ORAN*

Regional Plant Protection Research Institute, Diyarbakır, TURKEY

A B S T R A C T

This study has been accomplished by going over the publications concerning the powdery mildews in Turkey and through the identification of host species of powdery mildews we have gathered in our explorations from the different parts of Turkey from 1964-1972. The numbers of powdery mildew species (having ripe cleistothecium) whose identifications can precisely be made are 50 and 395 plant species and subspecies have been recorded as hosts for these powdery mildew species. Six of these powdery mildew species are new for Turkey **(Sphaerotheca epilobii, S. macularis, S. mors-uvea, Erysiphe labiatarum, Microsphaera astragali, Phyllactinia moricola).**

We have also recorded 26 plant species and subspecies, as host for powdery mildew although we could not have detected or detected only unripe deistothecium on. Totally 421 plant species and subspecies had been recorded as hosts for powdery mildew up to now in Turkey and 192 out o 421 were identified as hosts for the first time by this work.

INTRODUCTION

Powdery mildews are the most common fungi in the world. In fact, they have been recorded in arctic and subarctic regions such as Greenland, Iceland, Alaska and also in tropical countries like Kenya, Sudan Java, Ve-

*) The correspondance address of the author is «Y. Kâzım ORAN, Senior Plant Scientist of Elanco, İzmir, TURKEY»

nezuella. HIRATA (1966) reported that 7187 species dispersed over 44 orders, 149 families and 1289 genera. The number of studies made on powdery mildews is limited in spite of their variety of species, abundant host plants and economic importance in Turkey. İYRİBOZ (1938), İYRİBOZ ve İLERİ (1941) briefly mentions some powdery mildew species which are harmful to culture plants. GEDİZ (1940), KARACA (1958), GOFFART (1950), AKDOĞAN (1952), SÖKMEN (1952) pointed out some powdery mildew species on culture plants. BREMER et al (1947, 1952) detected 31 powdery mildew species in Turkey. KARACA (1961) reports that, 32 powdery mildews were detected from 110 host species till 1961. ORAN (1967) found 38 species, (10 of them new to Turkey) during his studies on powdery mildews in Central Anatolia. He also described 225 different plant species and subspecies as host of powdery mildew.

It is a fact there should be greater number of powdery mildew species and host plants in Turkey than pointed out in previous paragraph since she possesses different climatic characteristics of a big continent and also has many different types of micro-climates. As a matter of fact the material we have collected during our explorations in different parts of Turkey through 1964-1972 is clear indication and proof of this fact.

MATERIALS AND METHODS

The material of this investigation consists of the powdery mildew infected plants which we have collected in our exploration in different parts of Turkey during 1964-1972. We have used «Flora Orientalis by BOISSIER (1867, 1872, 1875, 1879, 1884). «Syllabus der Pflanzen Familien» by ENGLER (1964), «Flora of Turkey» by DAVIS (1965, 1966, 1969), «Gray's Manual of Botany» by FERNALD (1950), «Flowers of the Mediterrenean» by POLUNIN and HUXLEY (1965), «Flora Palaestina» by ZOHARAY (1966), «Illustrated Flora of Northern U.S.A.» by GLEASON (1963), «Türkiye Bitkileri» by BİRAND (1952) as source, in the identification of the host species. Some of the hosts whose identification could not be made precisely were defined and named by help of Dr. Kemal Karamanoğlu and Dr. Rıza Çetik in Herbarium Turcicum of Ankara University Dept. of Botany. The hosts of the **Graminea** family were defined by Dr. Baytop at the Pharmacology Dept. of the Istanbul University. We made definitions of some other plats with the assistance of Prof. Viennot- Bourgin in his laboratory[1]. We made use of some publications such as «Die Erysiphaceen Mitteleuropas» BLUMER (1933), VIENNOT- BOURGIN (1956, 1958's publications on powdery mildew in France and Persia. The definitions of powdery mildew species were

1) Institut National Agronomique- Laboratoire de Botanique et Patholoqie Vegetale - Paris.

based on the cleistothecium sizes, shapes of fulcres and the number of ascospores in ascus. The species which can not be described precisely have been sent to Dr. Viennot- Bourgin in Paris aid to Dr. Koji Hirata[1] for a decisive identification.

RESULTS AND DISCUSSION

Erysiphaceae family contains 12 genera : **Brasiliomyces, Cystotheca, Erysiphe, Phyllactinia, Podosphaera, Leveillula, Sphaerotheca, Microsphaera, Medusosphaera, Typholochaeta, Uncinula, Oidium.** No powdery mildew species have been recorded belonging to **Brasiliomyces, Cystotheca, Medusosphaera** and **Typhulochaeta** genera in Turkey. As can be seen upon the examination of Table I, the number of the powdery mildew species recorded in Turkey up to date and the corresponding genera are follows :

Genera	Number of Powdery Mildew Species
Sphaerotheca	7
Podosphaera	3
Erysiphe	22
Microsphaera	8
Uncinula	6
Phyllactinia	3
Leveillula	1

Fifty powdery mildew species whose precise definitions were made had been found on 421 host plants. The presence of 6 powdery mildews first recorded in Turkey as a result of this study **(S. epilobii, S. macularis, S. mo s-uvae, E. labiatarum, M. as ragali, Ph. moricola).** The reason in the abundance of the host plants and powdery mildew species found in Turkey is due to the many different micro-climates. If, a detailed and specific research was carried out for the detection of powdery mildew and host plant species, these numbers especially in respect of the host plants would be much greater.

A great majority of the plants we have recorded as powdery mildew hosts are dicotyledonous host plants. **E. graminis** species were recorded on the majority of monocotyledonous plants and **L. taurica** was present on three hosts from the **Liliaceae** family of the same order (Table 2).

Out of 421 plants hitherto recorded as powdery mildew hosts in Turkey, 192 plants were mentioned as hosts for the first time by this study. **L. taurica** species recorded on 75 host species and subspecies with precise definitions is seen to be the most common one in Turkey. As have been seen in Table 2, this species have been recorded especially on various hosts in Central, Eastern and Southeastern regions of Turkey. In other words, fungus grows, usually in hot and warm regions. Some researchers believe that **Leveillula** has adaptes itself towards warm and dry weather conditions because of its endophytic character (PAL-

2) Faculty of Agriculture, Niigata University - Japon.

Table 1. **Number of host plant species, subspecies of powdery mildew species.**

Species of powdery mildew	Number of host plant species
Sphaerotheca epilobii (Lk.) Sacc.	2
« **euphorbiae** (Cast.) Salm.	3
« **fugax** Penz. et Sacc.	3
« **fuliginea** (Schlecht.) Salm.	15
« **macularis** (Wallr) Magn.	2
« **mors-uvae** (Schw.) Berk. et Court.	2
« **pannosa** (Wallr.) Lév.	4
Podosphaera leucotricha (Ell. et Ev.) Salm	3
« **oxyacanthae** (DC.) De Bary	5
« **trydactyla** (Wallr.) De Bary	4
Erysiphe alhagi Sor.	1
« **aquilegiae** DC.	2
« **cichoracearum** DC.	32
« **communis** (Wallr.) Fr.	42
« **convolvuli** DC.	3
« **cruchetiana** Blumer	2
« **depressa** (Wallr.) Schlecht.	1
« **fischeri** Blumer	1
« **galeopsidis** DC.	12
« **galii** Fuckel.	2
« **graminis** DC.	70
« **horridula** Lév.	11
« **labiatarum**	1
« **lamprocarpa** (Wallr.) Duby	5
« **martii** Lév.	7
Erysiphe nitida (Wallr.) Rabh.	9
« **pisi** DC.	11
« **polygoni** DC.	19
« **salvia** (Jacz.) Blu.	1
« **tortilis** (Wallr.) Fr.	2
« **umbelliferarum** De Bary	13
« **urticae** (Wallr.) Klotz	1

Table 1. **(Continued) Number of host plant species, subspecies of powdery mildew species.**

Species of powdery mildew		Number of host plant species
Microsphaera alphitoides Grif. et Maub		13
«	**astragali** (DC.) Sacc.	1
«	**berberidis** (DC.) Lév.	4
«	**colutea** Komarov	4
«	**evonymi** (DC.) Sacc.	1
«	**lonicerae** (DC.) Winter	1
«	**mougeotii** Lév.	4
«	**viburni** (Duby) Blumer.	1
Uncinula sp.		1
«	**aceris** (DC.) Sacc.	3
«	**clandestina** (Biv. Bern) Schro.	1
«	**prunastri** (DC.) Sacc.	2
«	**necator** (Schwein) Burr.	1
«	**salicis** (DC.) Winter	5
Phyllactinia mespili (Cast.) Blu.		3
«	**moricola** Saw.	1
«	**suffulta** (Reb) Sacc.	23
Leveillula taurica (Lév.) Arn.		75
Oidium spp.		26
TOTAL	51	461

TI, 1959). On the contrary, **Phyllactinia** which is also an endophitc as **Leveillula** is common in cooler regions. It is observed that **L. taurica** has a lot of hosts in countries with a severe steppe climate. As a matter of fact, 72 hosts of this fungus were recorded in Persia, 50 were recorded in Israel and 162 in Kafkas regions of Russia (HIRATA, 1966).

E. graminis, second in rank, as far as the rumber of its host concerned, was found on 70 plants. It is common on cereals in all regions of Turkey as is the case throughout the world. Because **E.** graminis is present on only monocotyledonous host plants, having thick grown hyphal hair around cleistothecium and finger like processes of haustoria and bulbous base of conidiophores, some researchers think that it should be named

as a seperate genus. GOLOVIN (1953), named this genus as **Blumeria,** however we have used **E. graminis** in nomenclature.

E. communis has been recorded in 42 host, plants, namely **Brassica, Beta, Delphinium, Lycopersicum, Medicago, Phaseolis, Trifolium.** These correspond to the genera of econdmically important plant species.

E. cichoracearum has been recorded on 32 host plant species some of which are the culture plants such as **Abelmoschus, Aster, Cucurbita, Cucumis, Helianthus, Lactuca** and **Solanum. Phyllactinia suffulta** has been found on 23 trees and shrubs represented by the: **Acer, Amygdalus, Betula, Buxus, Corylus, Crataegus, Fagus, Fraxinus, Juglans, Paliurus, Pirus, Ulmus** genera. Sometimes a powdery mildew species is seen on more than one genus and species, ie., **E. pisi, E. communis, L. taurica** on **Vicia** genus; P. **oxyacantha, P. mespili, P. suffulta** on **Crataegus** genus; **E. communis, E. pisi, L. taurica** on **Medicago** genus; **U. prunastri, P. suffulta, P. trydactyla, S. pannosa** on **Prunus** genus; **E. comminis, E. pisi, E. martii,** and **L. taurica** on **Trifolium** genus.

Powdery mildew species in Turkey are common at altitudes up to 2500 m. above sea level. For example, we recorded **S. macularis** in Artvin-Borçka mountains (alt. 1980 m.), **E. nitida** on Tunceli mountains (alt. 2100 m.), **E. communis** on **Sophora** around Bitlis mountains at 2500 m.

ÖZET

TÜRKİYE'DE KÜLLEME FUNGUSLARININ DAĞILIMI VE KONUKÇULARI

Çalışma Türkiye'de bugüne kadar külleme fungusları üzerinde yapılan yayımların gözden geçirilmesi ve 1964-1972 yıllarında ülkenin çeşitli yörelerine yaptığımız gezilerde toplanan fungus konukcu ve türlerinin tanımlarının yapılmasıyla ortaya konmuştur. Tanımları tam olarak yapılabilen olgun cleistotheciumlu külleme türleri 50 adet olup bu 50 tür 395 konukcu tür ve alt türü üzerinde saptanmıştır. Türlerden **Sphaerotheca epilobii, Sphaerotheca macularis, Sphaerotheca mors-uvae, Erysiphe labiatarum, Microsphaera astragali, Phyllactinia moricola** Türkiye için yenidir.

Üzerinde cleistothecium hiç bulunmayan veya yalnızca olgunlaşmamış cleistothecium bulunan 26 bitki tür ve alt türü de külleme konukcusu olarak kaydedilmiştir. Türkiye'de bugüne kadar saptanan külleme konukçusu 421 bitki ttür ve alt türünün 192 adedi ilk defa bu çalışma ile ülkede konukcu olarak belirtilmektedir.

Table 2. **The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plants	Powdery mildew species	Place or literature
Abelmoschus esculentus Moench	**E. cichoracearum**	Bremer et al. (1947)
Acanthus mollis L.	«	Nallıhan, 1968
Acer campestre L.	**U. aceris**	Rize, 1968
« «	**P. suffulta**	Rize, 1968
Acer negundo L.	**U. aceris**	Oran (1967)
« «	**L. taurica**	Diyarbakır, 1967
« **pseudoplatanus** L.	**U. aceris**	Oran (1967)
Adonis aestivalis L.	**E. nitida**	Hopa, 1969
Adonis vernalis L.	**O. sp.**	Oran (1967)
Aeqilops cylindrica Host.	**E. graminis**	Oran (1967)
« **ovata** L.	« «	Oran (1967)
« **triancialis** L.	«	Bremer et al. (1952)
« **variabilis**	«	Varto, 1970
Aethusa cynapium L.	E. umbelliferarum	Oran (1967)
Agropyron cristatum (L.) Gaertn.	E. graminis	Bremer et al. (1952)
« **intermedium** (Host)	«	Oran (1967)
Agrostis alba L.	«	Oran (1967)
Alhagi came'orum Fich.	**E. alhagi**	Bremer et al. (1947)
Allium cepa L.	**L. taurica**	Oran (1967)
« **porrum** L.	«	Oran (1967)
« **sativum** L.	«	Karacabey, 1972
Alopecurus agrestis L.	**E. graminis**	Yalova, 1971
« **myosuroides** Huds.	**E. graminis**	Bursa, 1971
« **pratensis** L.	**E. graminis**	Göbetez (1963)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Alkanna orientalis	**O. sp.**	Bremer et al. (1947)
Althae cannabina L.	**L. taurica**	Bremer et al. (1947)
« **rosae** Cav.	«	Karaca (1961)
Amygdalus communis L.	**S. pannosa**	Karaca (1961)
« «	**P. suffulta**	Karaca (1961)
Anchusa sp.	**E. horridula**	Oran (1967)
« **hybrida** Ten.	«	Oran (1967)
« **officinalis** L.	«	Batman, 1966
Andrachne telephioides L.	**L. taurica**	Bremer et al. (1947)
Anethum graveolens L.	**E. Umbelliferarum**	Oran (1967)
Anisum vulgare Gearth.	«	
Anthemis tinctoria L.	**L. taurica**	Siirt, 1968
Anterrhium majus L.	**O. sp.**	Oran (1967)
Apera spica-venti (L.) P.	**E. graminis**	Yalova, 1971
Aquilegia sp.	**E. aquilegiae**	Oran (1967)
Aquilegia vulgaris L.	**E. aquilegiae**	Eskişehir, 1967
Arctium lappa L.	**E. depressa**	Oran (1967)
« «	**S. fuliginea**	Oran (1967)
« **tomentosa** Mill	**E. cichoracearum**	Adıyamın, 1971
Aremonia agrimoides (L.) DC.	**S. macularis**	İzmir, 1972
Arrhenatherum avenaceum P.	**E. graminis**	Kastamonu, 1970
Atriplex turcomanica Fisch. Mev.	**L. taurica**	Ovacık, 1966
Aster amellus L.	**E. cichoracearum**	Elazığ, 1967
« **novi-belgii** L.	«	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Astragalus sp.	**M. colutea**	Oran (1967)
« **cicer** L.	**M. astragali**	Diyarbakır, 1967
« **florulentus** Boiss	**L. taurica**	Adıyaman, 1969
Avena barbata Brot	**E. graminis**	Karaca (1961)
« **fatua** L.	«	Karacabey, 1972
« **sativa** L.	«	Bremer et al. (1947)
« **sterilis** DC.	«	Bremer et al. (1947)
Begonia maculeta Reddi	**O. sp.**	Oran (1967)
Berberis sp.	**M. berberidis**	Bremer at al. (1952)
« **crataegina**	«	Oran (1967)
« **vulgaris** L.	«	Erzincan, 1966
Beta intermedia Bunge	**E. communis**	Bremer at al. (1947)
« **vulgaris** L.	«	Bremer at al. (1947)
« « var. **cruentha** Alef	«	Oran (1967)
Betula alba L.	**P. suffulta**	İnebolu, 1967
Brachypodium pinnatum (L.) P.	**E. graminis**	Sarıcakaya, 1964
« **sylvaticum** (Huds) P.	«	Beypazarı, 1968
Brassica nepus L.	**E. communis**	Eskişehir, 1967
« **nigra** (L.) Koch.	«	Bremer at al. (1947)
« **oleracea** L.	«	Kastamonu, 1967
« **rapa** L.	«	Elazığ, 1967
Bromus alopecurus Poir.	**E. graminis**	Ceylanpınar, 1964
« **arvensis** L.	«	Oran (1967)
« **commutatus** Schrad.	«	Yusufeli, 1968

Table 2. (Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.

Host Plant	Powdery mildew species	Place or literature
Bromus inermis Leyss.	«	Artvin, 1968
« **madritensis** L.	«	Oran (1967)
« **ramosus** Huds.	«	Pülümür, 1969
« **scoparinus** L.	«	Akçakale, 1964
« **secalinus** L.	«	Borçka, 1964
« **sterilis** L.	«	Oran (1967)
« **tectorum** L.	«	Oran (1967)
Bupleurum sp.	**L. taurica**	Oran (1967)
Bupleurum aureum Fisch.	**E. umbelliferarum**	Tunceli, 1966
Buxus sp.	**P. suffulta**	Boyabat, 1968
Calendula officinalis L.	**S. fuliginea**	Bremer et al. (1952)
Calmintha sp.	**O. sp.**	Oran (1967)
Cannabis sativa L.	**L. taurica**	Teşköprü, 1968
Capparis sicula Duham	«	Bremer et al. (1947)
Capsicum annuum L.	«	Bremer et al. (1947)
Capsella bursa-pastoris L.	**E. communis**	Diyarbakır, 1968
Carlina acaulis L.	**L. taurica**	Oran (1967)
Carpinus sp.	**P. suffulta**	Oran (1967)
Carum corvi L.	**E. umbelliferarum**	Malatya, 1967
Castanea sativa L.	**P. suffulta**	İnebolu, 1967
« «	**M. alphitoides**	Oran (1967)
Catalpa bignonioides Walt	**L. taurica**	Karaca (1961)
Celtis caucasica Welld	**U. sp.**	Artvin, 1968
Centaurea sp.	**E. cichoracearum**	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Centaurea calcitrapa L.	**L. taurica**	Bremer et al. (1947)
« **solstitalis** L.	«	Bremer et al. (1952)
« **solstitalis**	**E. cichoracearum**	Oran (1967)
« **squorous** Willd	**L. taurica**	Karaca (1961)
Cephalaria alpina (L) Schrad	**S. fuliginae**	Göbelez (1963)
« **syriace** Schrad	«	Bremer et al. (1947)
Cerasus avium (L) Moench	**P. trydactyla**	Darenbe, 1969
Cerinthe minor L.	**E. horridula**	Karaca (1961)
« «	**L. taurica**	Bremer et al. (1947)
Chenopodium album L.	«	Diyarbakır, 1968
« **murale** L.	«	Elazığ, 1969
Chondrilla juncea L.	«	Bremer et al. (1947)
Chrozophora tinctoria (L.) A. juss	**E. communis**	Adana, 1968
Cicer arietinum L.	**L. taurica**	Hakkari, 1966
Cichorium intybus L.	**S. fuliginae**	Oran (1967)
« «	**E. cichoracearum**	Bremer et al. (1952)
Cirsium arvense (L.) Scop	**L. taurica**	Bremer et al. (1947)
Citrullus vulgarus Schrad	**E. cichoracearum**	Çınar, 1970
Clematis sp.	**E. nitida**	Pülümür, 1971
Colutea arborescens L.	**M. colutea**	Oran (1967)
Conium maculatum L.	**E. umbelliferarum**	Viranşehir, 1967
Convolvulus arvensis L.	**E. convolvuli**	Bremer et al. (1947)
« **galaticus** Rostan	«	Bremer et al. (1947)
« **sepium** K.	«	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Corispermun hyssopifolium L.	**L. taurica**	Van, 1966
Coronilla varia L.	**O. sp.**	Oran (1967)
« «	**L. taurica**	Van, 1966
Cornus australis C. et. Mey	**E. tortilis**	Oran (1967)
« **mas** L.	«	Borçka, 1968
Corylus avellana L.	**P. suffulta**	Bremer et al. (1947)
Cotoneaster sp.	**P. mespili**	Tunceli, 1971
Cramba orientalis L.	**E. communis**	Van, 1966
Crataegus aronia Bosc	**P. suffulta**	Oran (1967)
« cf. **monogyna** Jacq.	**P. oxyacantha**	Erzincan, 1971
« «	**P. mespili**	Bremer et al. (1947)
« **oblonga** Mill	**P. oxyacantha**	Pertek, 1966
« **oxyacantha** L.	**P. suffulta**	Oran (1967)
« «	**P. mespili**	Oran (1967)
Crepis sp.	**L. taurica**	Oran (1967)
Crozophora tinctoria L.	«	Bremer et al. (1947)
Cucumis melo L.	**E. cichoracearum**	Bremer et al. (1947)
« **sativus** L.	«	Nallıhan, 1966
Cucurbita pepo L.	**S. fuliginae**	Bremer et al. (1947)
« «	**E. cichoracearum**	Bremer et al. (1952)
Cydonia vulgaris L.	**P. oxyacanthae**	Bremer et al. (1947)
Cynodon dactylon L.) Pers	**E. graminis**	Hakkari, 1966
Cytisus sp.	**E. communis**	Erzincan, 1966
Cytospermum sp.	**O. sp.**	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Dactylis glomerata L.	**E. graminis**	Oran (1967)
Datura stramonium L.	**O. sp.**	Menemen, 1972
« «	**E. cichoracearum**	Oran (1967)
Daucus carota L.	**E. umbelliferarum**	Oran (1697)
« «	**L. taurica**	Oran (1697)
Delphinium ajacis	**E. nitida**	Oran (1697)
« **hybridum** Host	«	Oran (1697)
« «	**E. communis**	İzmir, 1972
Dianthus sp.	**E. polygoni**	İzmir, 1972
« **barbatus** L.	**O. sp.**	Bremer et al. (1947)
« «	«	Ankara, 1964
« **caryophllus** L.	**E. polygoni**	Oran (1967)
Digitalis orientalis Lam.	**L. taurica**	Bremer et al. (1952)
Digitaria sanguinalis (L.) Scob.	**E. graminis**	Aydın, 1973
Dipsacus lacianthus L.	**S. fugax**	Göbelez (1963)
Echinophora sipthorpiana Guss.	**L. taurica**	Bremer et al. (1952)
Echinospermum sp.	**E. horridula**	Muş, 1967
Echium platagineum	«	Selli (1952)
Elaeaguns angustifolia L.	**L. taurica**	Göbelez (1963)
« **hortensis** Biele	«	Bremer et al. (1947)
Elymus caput-medusae L.	**E. graminis**	Siverek, 1968
« **crinutus** L.	«	Oran (1967
Epilobium sp.	**E. epilobii**	Artvin, 1968
« **hirsitum** L.	«	Erzincan, 1971

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Epilobium parfiflorum Schreb	**L. taurica**	Oran (1967)
Erodium gruinum L.	**S. fugax**	Bremer et al. (1952)
« **moschatum** (L.) L. Her.	«	Bremer et al. (1952)
Eryngium campestre L.	**L. taurica**	Bremer et al. (1947)
Eucalyptus sp.	**O. sp.**	Erdemli, 1968
Euphorbia sp.	**L. taurica**	Diyarbakır, 1970
«	**O. sp.**	Diyarbakır, 1969
« **falcata** L.	**S. euphorbia**	Oran (1967)
« **helioscopia** L.	«	Oran (1967)
« **tinctoria** Boiss et. Henet	«	Oran (1967)
« **latifolia** Mill	**M. evonymi**	Bremer et al. (1947)
« **japonica** L.	**O. evonymi-japonici**	Bremer et al. (1947)
Fagopyrum ecsulentum Moench	**E. polygoni**	Trabzon, 1968
Fagus sylvatica L.	**P. suffulta**	Trabzon, 1968
Festuca arundinacea Schreb	**E. graminis**	Bitlis, 1967
« **glauca** Lam.	«	Pülümür, 1969
« **ovina** L.	«	Refahiye, 1971
« «	**O. sp**	Oran (1967)
« **pratensis** Huds	«	Kemaliye, 1970
Foenicum piperitum Presl.	**L. taurica**	Birecik, 1966
Fraxinus syriaca Boiss	**P. suffulta**	Bremer eta l. (1947)
Galium sp.	**E. galii**	Oran (1967)
« **aparine** L.	«	Oran (1967)
Galeopsis angustifolia Ehrh.	**E. galeopsis**	Bitlis, 1971

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Geranium pratense L.	**E. communis**	Hilvan, 1970
Glaucium sp.	«	Oran (1967)
« **corniculatum** L.	«	Bremer et al. (1947)
Glychrrhiza glabra L.	**L. taurica**	Bremer et al. (1947)
Gypsophila paniculata L.	**E. communis**	Erciş, 1966
Helianthus annuus L.	**E. cichoracearum**	Oran (1967)
Heliotropium sp.	**L. taurica**	Tatvan, 1966
Hibiscus esculentus L.	«	Karaca (1961)
« **trionum** L.	«	Bremer et al. (1947)
Holcus lanatus L.	**E. graminis**	Eruh, 1968
« **mollis** L.	«	Pertek, 1967
Hordeum bulbosum L.	**E. graminis**	Oran (1967)
« **distichon** L.	«	Oran (1967)
Hordeum hexastichon L.	**E. graminis**	Tosya, 1968
« **leporinum** Link.	«	Bafra, 1968
« **murinum** L.	«	Bremer et al. (1952)
« **sativum** Jess	«	Bremer et al. (1947)
« **secalinum** Schreb	«	Muş, 1971
« **spontaneus** C. Koch.	«	Solhan, 1971
« **vulgare** L.	«	Bremer et al. (1952)
Humulus lupulus L.	**E. cichoracearum**	Bilecik, 1967
Hydrangea hortensia Siebeld	**E. communis**	Hopa, 1968
« «	**O. sp.**	Oran (1967)
Impatines balsamina L.	**L. taurica**	Mersin, 1968

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Inula dysenterica L.	**E. cichoracearum**	Oran (1967)
Juglans sp.	**P. suffulta**	Arapkir, 1970
Laburnum sp.	**L. taurica**	Bremer et al. (1947)
Laburnum anagyriodes Med.	«	Bremer et al. (1952)
Lactuca sativa L.	**E. cochoracearum**	Oran (1967)
« **scariola** L.	«	Oran (1967)
« **serriola** L.	«	Oran (1967)
« **viminea** (L.) Presl.	**L. taurica**	Oran (1967)
Lagenaria leuncantha Rosby	**L. taurica**	Erzincan, 1971
« **vulgaris** Ser.	**S. fluginea**	Bremer el al. (1947)
Lamium album L.	**E. galeopsis**	Genç, 1969
« **maculatum** L.	«	Lice, 1967
« **ponticum** Boiss	«	Oran (1967)
« **purpureum** L.	«	Bremer el al. (1947)
« **striatum** subth. et sm.	«	Oran (1967)
« « var. **striatum**	«	Oran (1967)
Lampsana communis L.	**O. sp.**	Bremer el al. (1947)
Lathyrus sp.	**E. martii**	Bremer el al. (1947)
« **luteus**	**E. communis**	Van, 1966
« **sericeus** Boiss	**E. martii**	Oran (1967)
Lepidium draba L.	**E. communis**	Adilcevaz, 1966
« **latifolium** L.	«	Oran (1967)
Leontoton sp.	**S. fluginea**	Oran (1967)
«	**L. taurica**	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Linaria coridifolia Desp.	«	Oran (1967)
Linum usitatissimum L.	**O. sp.**	Bremer el al. (1947)
Lithospermum apulum L.	**E. horridula**	Bremer et al. (1952)
« **arvense** L.	«	Oran (1967)
« **officinale** L.	«	Diyarbakır, 1969
Lolium aristatum Lag.	**E. graminis**	Ilgaz, 1966
« **perenne** L.	«	İnebolu, 1967
« **persicum** Boiss	**E. graminis**	Yükselova, 1966
« **temulentum** L.	«	Ceylanpınar, 1967
Lonicera caprifolium L.	**M. lonicerae**	Karaca (1961)
Lycium sp.	**M. Mougeotii**	Karaca (1961)
« **barbarum** L.	«	Oran (1967)
« **halimifolium** Mill	«	Bremer et al. (1952)
« **vulgare** Dun.	«	Oran (1967)
Lupinus sp.	**F. pisi**	Viranşehir, 1970
« **albus** L.	«	Ergani, 1970
Lycopersicum esculentum Mill.	**L. taurica**	Gürcan (1959)
« « «	**E. communis**	Erzincan, 1966
Lycopus europaeus L.	**E. cichoracearum**	Tunceli, 1969
Mahonia aquifolium Nutt.	**M. berberidis**	Ilgaz, 1967
Marrubium sp.	**O. sp.**	Oran (1967)
Matricaria chomomilla L.	«	Oran (1967)
Malus communis L.	**P. leurotricha**	Bremer (1952)
Malva sp.	**O. sp**	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Medicago fulcata L.	**E. communis**	Çınar, 1967
Medicago rigidula L.	**E. pisi**	Oran (1967)
« **sativa** L.	**E. communis**	Göbelez (1963)
« «	**L. taurica**	Bremer et al. (1947)
« «	**E. pisi**	Bremer et al. (1947)
Melilotus albus Desr.	**E. mastii**	Oran (1967)
« **officinalis** (L.) Med.	«	Bremer et al. (1947)
Mentha arvensis L.	**O. sp.**	Nusaybin, 1967
Mespilus germanica L.	**P. oxyacantha**	Adilcevaz, 1966
Moringa persica	«	Bozova, 1969
Morus alba L.	**P. suffulta**	Bremer et al. (1952)
« **nigra** L.	**P. morricola**	Elazığ, 1967
Myosotis arvensis (L.) Hill	**E. horridula**	Bingöl, 1969
Mulgedium sp.	**O. sp.**	Oran (1967)
Muscari sp.	«	Tunceli, 1970
Nepeta nuda L. Neilr.	**E. galeopsidis**	Bremer et al. (1947)
« **pannonica** L.	«	Malatya, 1967
« «	**E. cichoracearum**	Pülümür, 1970
Nicotiana tabaccum L.	«	Bremer et al. (1947)
Noeae spinosissima L.	**L. taurica**	Bremer et al. (1947)
Onobrychis grandis Lipsy	«	Bitlis, 1971
« **hypargyrea** Boiss	«	Bremer et al. 1947)
« **viciifolia** Scop	**E. mastii**	Bremer et al. 1947)
Ononis arvensis L.	**E. communis**	Eruh, 1968

Table 2. (Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.

Host Plant	Powdery mildew species	Place or literature
« **spinosa** L.	**L. taurica**	Bremer et al. (1947)
« «	**E. cruchetiana Blumer**	Bremer et al. (1952)
Onosma sericeum W.	**E. horridula**	Edilcevaz
Oxalis sp.	**L. taurica**	Refahiye, 1971
Paliurus aculeatus Lam.	**P. suffulta**	Bremer et al. (1947)
« **australis** Gaertn.	«	Oran (1967)
Papaver rhoeas L.	**E. communis**	Ergani, 1970
Peganum harmala L.	**L. taurica**	Karaca (1961)
Petroselinum sativum Hoffm.	**E. umbelliferarum**	Oran (1967)
Phalaris arundinacea L.	**E. graminis**	Silvan, 1966
Phaseolus vulgaris L.	**E. communis**	Elazığ, 1967
Phleum pratense L.	**E. graminis**	Eruh, 1969
Phlomis armeniaca Willd.	**L. taurica**	Bremer et al. (1952)
« **brevilebris** Ehrenb.	«	Göbelez (1963)
« **herba-venti** L.	**E. galeopsidis**	Bremer et al. (1952)
« **orientalis** Mill.	**E. labiatarum**	Adilcevaz, 1966
« **purpurea** L.	**L. taurica**	Malatya, 1967
Phragmites communis Trin.	**E. graminis**	Kurtalan, 1967
Physalis alkakengi L.	**S. fuliginea**	Nusaybin, 1968
Pirus communis L.	**P. Suffulta**	Bremer et al. (1952)
Pistacia terebinthus L.	«	Siirt, 1969
Pisum arvense L.	**E. communis**	Maden, 1970
« **satium** L.	«	İnebolu, 1969
Platago lanceolata L.	**E. lamprocarpa**	Eruh, 1967

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Plantago crinata Ccfrab.	**E. lamprocarpa**	Karaca (1961
« **lanceolata** L.	**S. fuliginea**	Bremer el al. (1947)
« **major** L.	**E. lamprocarpa**	Bremer el al. (1947)
« «	**S. fluginea**	Bremer el al. (1947)
« **media** L.	**E. lamprocarpa**	İnebolu, 1969
« **ovata** Forsk.	«	Oran (1967)
Plumbago europaea L.	**L. taurica**	Bremer et al. (1947)
Poa annua L.	**E. graminis**	İnebolu, 1967
« **bulbosa** L.	«	Oran (1967)
« « var **viruposa** Koet.	«	Oran (1967)
« **glauca** Valh.	«	Refahiye, 1971
« **memoralis** L.	«	Hopa, 1968
« **pratensis** L.	«	Çarşamba, 1968
« **trivialis** L.	«	Suruç, 1967
Polygonum arenaria Waldst Kit.	**E. polygoni**	Borçka, 1964
« **aviculare** L.	«	Bremer et al. (1947)
« **convolvulus** L.	«	İnebolu, 1967
« **hydropiper** L.	«	Oran (1967)
« **kitaibelinum** Sadd.	«	Oran (1967)
« **lapathifolium** Ait.	«	Bremer et al. (1947)
« **maritimum** L.	«	Oran (1967)
« **perricaria** L.	«	Bitlis (1971)
Populus alba L.	**U. salicis**	Yeşilyurt, 1967
« **canadensis** Moench	«	Erzincan, 1971

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Populus nigra L.	«	Bremer el al. (1947)
« **tremula** L.	«	Karaca (1961)
Potenntilla anserina L.	**S. macularis**	Borçka, 1964
Prunus sp.	**U. prunastri**	Bremer et al. (1952)
« **armeniaca** L.	**P. trydactila**	Bremer et al. (1947)
« **cerasus** L.	«	Oran (1967)
« **communis** var **amara** C.	**P. suffulta**	Oran (1967)
« **mahaleb** L.	**P. trydactila**	Mardin, 1967
« **persica** L.) Batsch.	**S. pannosa**	Bremer et al. (1947)
« **spinosa** L.	**U. prunastri**	Oran (1967)
Quercus alba L.	**M. alphitoides**	Ankara, 1964
« **armeniaca** Kk:	«	Bingöl, 1969
« **brutia** Ten.	«	Oran (1967)
« **cerris** L.	«	Lice, 1969
« **cocccifera** L.	«	Bergama, 1972
« **ilex** L.	«	Erdemli, 1968
« **infectoria** Oliv.	«	Tarsus, 1968
« pedunculata Ehrh.	«	Bremer et al. (1947)
« **pubescens** Willd.	«	Karaca (1961)
« **rubor** L.	«	Göbelez (1963)
« **sessilis** Ehrh.	«	Oran (1967)
« **sessiliflora** Salisb.	«	Kelkit, 1968
Ranunculus arvensis L.	**E. nitida**	Tunceli, 1971
« **monspeliacus** L.	«	Oran (1967)

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Ranunculus repens L.	«	Bremer et al. (1952)
« **sardous** Cr.	«	Bremer et al. (1952)
Raphanus raphanistrum L.	**E. communis**	Muş, 1971
Rhamnus sp.	**P. suffulta**	Erzincan, 1971
Rhododendron ponticum L.	«	İnebolu, 1969
Ribes grossularia L.	**S. mars-uvae**	Ilgaz, 1968
« **rubrum** L.	«	Erzincan, 1971
Robinia hispida	**E. communis**	Göbelez (1963)
« «	**E. martii**	Bremer et al. (1952)
Rosa canina L.	**S. pannosa**	Oran (1967)
« **sulphurea** Ait.	«	Bremer et al. (1947)
Rubus fructicosus L.	**P. suffulta**	Oran (1967)
Rumex sp.	**L. taurica**	Refahiye, 1971
«	**E. polygoni**	Bremer et al. (1947)
« **acetosa** L.	«	Erzincan, 1971
« **conglomeratus** Nurray	«	Oran (1967)
« **crispus** L.	«	Kemah, 1971
« **ptiantia** L.	«	Bremer et al. (1952)
« **scutatus** L.	«	Karacebey, 1972
Salix alba L.	**U. salicis**	Van, 1966
Salvia sp.	**E. salviae**	Oran (1967)
« **similata** Hausskn.	**L. taurica**	Karaca (1961)
Scandix pecten-veneris L.	**E. umbelliferarum**	Bremer et al. (1947)
Scleropoa rigida (L.) Griseb.	**E. graminis**	Ergani, 1969

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Scolymus hispanicus L.	**L. taurica**	Karaca (1961)
Scutellaria sp.	«	Halfeti, 1966
Secala cereala L.	**E. graminis**	Muş, 1966
« **montanum** Guss.	«	Yüksekova, 1966
Senecio sp.	**L. taurica**	Oran (1967)
« **vernalis** L.	**E. cruchetiana Blum.**	Bremer et al. (1947)
« « W.K.	**E. fisheri Blum.**	Bremer et al. (1952)
« **vulgaris** L.	**E. cichoracearum**	Bremer et al. (1947)
Seteria italica (L.) P. Beauv.	**E. graminis**	Osmaniye, 1968
« **viridis** (L.) P. Beauv.	«	Selçuk, 1968
Silene sp.	**L. taurica**	Akçakale, 1967
Sinapsis alba L.	**E. communis**	Bitlis, 1971
« **arvensis** L.	«	Oran (1967)
Sisymbrium sophia L.	«	Bremer et al. (1952)
Solanum melongena L.	**E. cichoracearum**	Oran (1967)
« «	**L. taurica**	Bremer et al. (1947)
« **tuberosum** L.	«	Bremer et al. (1947)
« «	**O. sp.**	Oran (1967)
Sonchus sp.	**E. cichoracearum**	Oran (1967)
« **asper** (L.) Hill.	«	Oran (1967)
Sophora alopesuroides L.	**E. communis**	Bitlis, 1968
« «	**M. colutea**	Oran (1967)
Stachys alpinus L.	**E. galeopsidis**	Tunceli, 1971
« **anuus** L.	«	Erzincan, 1971

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Taraxacum officinale Weber.	**S. fluginea**	Bremer et al. (1947)
« **vulgare** (Lans.)	**E. cichoracearum**	Oran (1967)
Tordylium officinale L.	**E. umbelliferarum**	Bremer et al. (1952)
Torilis anthriscus (L.) Gmel.	«	Ovacık, 1966
« **leptophylla** Rebh.	«	Ergani, 1967
« **grandiflora** Boiss.	«	Ergani, 1967
Tribulus terrestris L.	**L. taurica**	Aydın, 1962
Trifolium campestre Schreb.	**E. communis**	Tatvan, 1971
« **medium** L.	«	Lice, 1968
« pratense L.	«	Muş, 1966
« «	**E. pisi**	Oran (1967)
« «	**E. martii**	Oran (1967)
« **repens**	**E. communis**	Van, 196
Trisetum flavescens (L.) P. Beauv.	**E. graminis**	İnebolu, 1967
« **panicum** (Lam.) Pers.	«	Halfeti, 1966
Triticum aestivum L.	«	Van, 1966
« **dioccum** Schrank.	«	Erzincan, 196
« **durum** Desf.	«	Oran (1967)
« **sativum** Lam.	«	Bremer et al. (1947)
Tropaeolum majus L.	**L. taurica**	Bremer et al. (1947)
Ulmus campestris L.	**U. clandestina**	Bremer et al. (1947)
« «	**P. suffulta**	Bremer et al. (1952)
Urtica dioica L.	**E. urtica**	Kastamonu, 1969
Verbana officinalis L.	**E. cichoracearum**	Siverek, 1970

Table 2. **(Continued) The species, hosts and distribution of powdery mildew fungi in Turkey.**

Host Plant	Powdery mildew species	Place or literature
Verbascum abietinum Barb.	«	Istanbul, 1971
Veronica anagalloides Gun.	**S. fluginea**	Oran (1967)
« «	**O. sp.**	Oran (1967)
Viburnum opulus L.	**M. viburni**	Oran (1967)
Vicia sp.	**L. taurica**	Bremer et al. (1947)
« **elegans** var **asiatica** Freyn.	**E. pisi**	Oran (1967)
« **ervilla** L.	«	Oran (1967)
« **faba** L.	**E. communis**	Nusaybin, 1969
« «	**E. pisi**	Nusaybin, 1969
« **lutea** L.	**E. communis**	Ovacık, 1966
« **noeana** L.	**E. pisi**	Oran (1967)
« **persica** Boiss.	**E. communis**	Adilcevaz, 1966
« **sativa** L.	«	Adilcevaz, 1966
« «	**E. pisi**	Bremer et al. (1947)
« **tenuifolia** Roth.	**L. taurica**	Oran (1967)
Vincetoxicum nigrum L.	«	Bremer et al. (1947)
Viola tricolar L.	**E. cichoracearum**	Yalova, 1971
Vitis vinifera L.	**U. necator**	Bremer et al. (1947)
« «	**P. sp.**	Erzincan, 1967
Xanthium spinosum L.	**S. fluginea**	Bremer et al. (1947)
« **strumarium** L.	«	Bremer et al. (1947)
Xeranthemum annuum L.	**E. cichoracearum**	Oran (1967)
Zizyphora sp.	**E. polygoni**	Oran (1967)
Zygophyllum fabago L.	**L. taurica**	Karaca (1961)

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Investigations on Determination of the Cotton wilt Disease Agent and its Distribution, Severity, Loss Degree and the Ecology in Adana and Antalya Provinces

Mahdume ESENTEPE

Regional Plant Protection Research Institute, Bornova, İzmir, TURKEY

A B S T R A C T

Adana and Antalya provinces are the most important cotton growing areas of Turkey. Investigations were done on cotton wilt in these areas in 1970-1971. In these studies, nine districts in Adana and three districts in Antalya were surveyed.

The investigations elucidated the cause and the proportion of the cotton land infested by the fungus and percent infection in the fields. We have also studied the extend of damage done by the fungus and partially the relationship of the environmental conditions and the fungus. As a result of our investigations, we report that the Antalya regions is more affected by the fungus than Adana from point of percen infection, disease severity and the crop loss are higher in this region.

INTRODUCTION

Cotton seed and fiber very important place in Turkish economy as international trade items. Cotton covers half of the acreage devoted to the field crops in Turkey. The crop value exceeds 2,5 million TL. which is about 8 % of Turkey's agricultural income. The seed, fiber and oil cake brings 1,5 billion in foreign trade (Madran, 1969).

According to the 1970-1971 statistics, cotton is grown worldwide in 32.395 hectars of land and the crop produced is 11.316.000 tons. The average yield per hectar is 340 kilograms. With in the same period 527.000 hektars of land was planted cotton in Turkey and 400.000 tons of fiber was produced. The average yield per hectar

758 kilograms which is higher than the world average. Turkey takes the third place in yield following United Arabian Rebuplic (795 Kgs) and Russia (785 kgs) among the countries where more than 500.000 hectars of land had been assigned to the cotton (Madran, 1971).

The cotton growing areas of Turkey are Çukurova, Ege, Antalya and some other minor districts. 57 % of the cotton land are in Çukurova, specially in Adana where 48 % of Turkish cotton are produced. Antalya contains 4.7 % of the cotton land and produces 8 % of the crop (İncekara, 1971; Madran 1971).

The most important problem in cotton growing area is cotton wilt (Fig. I). The causal agents of this disease are **Fusarium** and **Verticillium. Verticillium** was first reported in Adana by Karel (1958) however, the species involved were not reported. This study was done to elucidate the causal agent, the proportion of the crop land infested by the fungus, the extend of damage done by the disease and to determine the relationship of the environmental conditions with the fungus.

MATERIALS AND METHODS

Surveys covered two provincial centers and twelve districts of Adana and Antalya. In Adana, Merkez, Karataş, Ceyhan, Osmaniye, Kozan, Kadirli, Karaisalı, Yumurtalık and Bahçe and in Antalya Merkez, Serik and Manavgat were covered. These districts were divided into 10.000 decar units. The counts were done in five different places of each unit area. The examining of the cotton plants on these places were done on four different raws of ten meter length. The disease evaluations were done by assigning a grade between zero and three to each individual plant, meaning.

0 — No disease expression is present

1 — Some simptom expression; fifty percent of plants wilted and yellowed but not dried

2 — Heavy simptoms; complete wilting and yellowing partial dring

3 — Heavy leaf loss or complete wilting resulting in plants death

During the survey studies in 1970, 725 fields were visited in Adana and Antalya (590 fields in Adana, 135 fields in Antalya). In 1971, 905 fields were covered (704 fields in Adana and 165 fields in Antalya). From each field a 30 cm section of a plant was taken to isolate the causal agent. Survey was done in 1970 and in 1971 seasons when the cotton was in «apple stage».

To explain the relation of the causal with the air and soil temperatures and the relative humidity, the meteorological records taken by General Directory of Meteorology were studied. To find the relation of the soil type with the disease the soil samples were taken at 20 cm depth from the both in-

fested and noninfested fields. A part of these soil samples were put in the plastic bags to analyze the salt concentration, organic matter, permeability, phosphorus content and the soil texture. Some soil was put in the sterile glass tubes to find out whether the fungus can be recovered from the soil.

The cotton plants and the soil collected and labeled in the fields were brought in the laboratories and transfered into the petri plates. The isolation medium was Nadakavukaren and Horner's (1959) 0,8 % alcohol-water agar. The petri dishes were kept in a 22 C° incubator for one week and then they were examined under microscope and the causal agent was determined.

The disease severity and percent infection in a province and in a district was determined by co-evaluating the values obtained for each field according to Bora ve Karaca (1970). Percent crop loss was determined from the figures of disease severity according to Chester's (1946) regression graphs.

RESULTS AND DISCUSSION

A — Agent of the disease

The results of the isolation studies in Adana and in Antalya region indicate the presence of **F. solani, F. semitectum, Alternaria, Mucor, Penicillium, Phizopus, Trichotecium** and **Cephalosporium** as well as **Verticillium.** These fungi other than **Verticillium** do not cause cotton wilt (Shadovalov and Rudolph 1930; Heale and Isaac 1965; Smit 1965). Because of the causal agent of **Fusarium (F. oxysporum** f. sp. **vasinfectum)** were not isolated while the **Verticillium** were isolated from all the diseased samples. For this reason the real causal agent of the cotton wilt of these regions is **Verticillium.**

The reason for the presence of **Verticillium** in Adana and in Antalya instead of **Fusarium** may be varying responses of the cotton varieties. **Fusarium** is more common in African and Asian cotton **(G. barbadence** and **G. herbaceum)** which have long fibers and **Verticillium** causes wilt in American cotton **(G. hirsitum)** (Amonymus, 1936; Rudolf and Harrison, 1939; Chester, 1942; Dickson 1956, Naim and Shaaban 1966, Schnathorst and Evans 1971). The varieties grown in Mediterrenian region are Deltapine 15/21, Coker 100/153 and Coker Caroline Queen 201 G which they are **G. hirsitum.** All **G. hirsitum** varieties which are expected to be sensitive to Verticillium. It is assumed that the causal agent is not **V. alboatrum** but the sclerotial type **V. dahliae** because it is the only species that can survive in an area where the temperatures are over 30 degrees (Isaac, 1968; Bell and Presley, 1969).

B — Distribution of the disease

Surveys demonstrated that the disease is present in Adana Merkez, Karataş and Osmaniye at various degrees but is not present in Ceyhan. Kozan, Kadirli, Karaisalı, Yumurtalık and

Bahçe (Map 1.) However in Antalya Merkez, Manavgat and Serik disease was present in both years (Map 2). The reason for this difference between the two areas may be that the fungus is prevalent in the soil in Antalya more than in Adana. The results of the soil analysis and meteorological studies do not indicate a great difference in these factors enough to affect the fungal growth.

C — Percentage of the Disease Incidence

Percentage of the disease incidence in Adana Merkez, Karataş and Osmaniye are given in Table 1 for 1970 and 1971 seasons.

Percentage of the disease incidence were given in Table 2 for all three districts in Antalya where the disease was present.

D — Disease severity and the crop loss

Disease severity and the crop loss due to **Verticillium** in Adana and Antalya as determined from the two years survey results are shown Table 3, and 4.

The loss in 1970 corresponds to 20,4 tons and in 1971 to 4,6 tons of fiber.

The loss degree in 1970 and 1971 were calculated as 1.33 % and 4 % which corresponds to 532.0 and 1751.0 tons of cotton fiber.

Air and soil temperatures and air humidity are not very different in Adana and Antalya regions. The main rea-

Table 1. Percentage of the disease incidence in Adana in 1970 and 1971

Surveyed district	Disease indidence (%)	
	1970	1971
Adana Merkez	0,04	0,09
Karataş	0,03	—
Ceyhan	—	—
Osmaniye	1,26	0,82
Kozan	—	—
Kadirli	—	—
Karaisalı	—	—
Yumurtalık	—	—
Bahçe	—	—
Average	0.04	0,01

Table 2. Percentage of the disease indidence in Antalya in 1970 and 1971

Surveyed district	Disease incidence (%)	
	1970	1971
Antalya Merkez	2,32	8,61
Manavgat	7,61	25,56
Serik	7.19	5,96
Average	4,83	13,85

Table 3. Disease severity and percentage of the crop loss due to **Verticillium** in Adan a in 1970 and 1971

Surveyed district	Disease severity %		Crop loss %	
	1970	1971	1971	1971
Adana Merkez	0,04	0.03	0,03	0,02
Karataş	0,02	—	0,01	—
Ceyhan	—	—	—	—
Osmaniye	0,87	0,35	0,61	0.29
Kozan	—	—	—	—
Kadirli	—	—	—	—
Karaisalı	—	—	—	—
Yumurtalık	—	—	—	—
Bahçe	—	—	—	—
Average	0,03	0.004	0,02	0,003

Table 4. Disease severity and percantage of the crop loss due to **Verticillium** in Antalya in 1970 and 1971

Surveyed district	Disease severity (%)		Crop loss (%)	
	1970	1971	1970	1971
Antalya Merkez	0,88	3,42	0,62	2,50
Manavgat	2,96	12,34	1,89	7,66
Serik	3,40	2,83	2,49	1,80
Average	2,06	6,54	1,33	4,00

son for the high incidence of the disease in Antalya is the heavy infestation of the soil by the fungus, on the contrary the fungus is not so widely spread in Adana distric.

The reason for the differences in the amounts of wilt present in Adana and Antalya regions may be due to different salt concentrations in the soil. The soil in two regions are rather similiar in Ph, organic matter, permeability, phosphorus content and the texture but a little different in their salt concentrations. Soil salt content in Antalya where the disease intensity in high is lower than Adana region which has less disease. We may assume a negative correlation between the soil salt concentration and the disease severity similiar to the report by Christensen et al (1954).

But it is believed that if the fungus becomes so widely distributed the disease may become more common in Adana too. Because the salt concentrations were not found as a visible factor the present of the disease in two regions.

ÖZET

ADANA VE ANTALYA İLLERİNDE PAMUKLARDA GÖRÜLEN SOLGUNLUK HASTALIĞININ ETMENİ, YAYILIŞI, KESAFETİ VE ZARAR DERECESİ İLE EKOLOJİSİ ÜZERİNDE ARAŞTIRMALAR

Araştırmanın amacı, adı gecen iki pamuk yetiştirme yönünden en önemli iki ili olan Adana ve Antalya'da pamuk solgunluk hastalığı üzerinde araştırma yapılmıştır.

Araştırmanın amacı, adı geçen iki ilde pamuklarda görülen solgunluk hastalığının etmenini, yayılış alanını, bitkilerin hastalığa yakalanma oranını, hastalık şiddetini, zarar derecesini ve etmenin çevre koşullarıyla ilişkisini saptamaktır.

Bu araştırmada Adana ve Antalya illeri sürvey alanı olarak seçilmiştir. Sürvey bu iki ile bağlı Adana'da 9, Antalya'da 3 olmak üzere 12 ilçede yapılmıştır. İki yıl süreyle yapılan sürveyler ve izolasyonlar sonunda bölgide pamuk solgunluğu hastalığı etmeninin **V. dahliae** olduğu saptanmıştır.

Her iki ilde 1970 ve 1971 yıllarına ait hastalığa yakalanma oranı, hastalık şiddeti ve bunun oluşturduğu zarar derecesi aşağıdaki gibi bulunmuştur.

Hastalığa yakalanma oranının, hastalık şiddetinin ve buna bağlı olarak zarar derecesinin Antalya'da daha çok, Adana'da ise daha az oluşunun nedeni, Adana topraklarında hastalık etmeni fungusun yaygın olarak bulunmadığı

	1970 (%)			1971 (%)		
	Hastalığa yakalanma oranı	Hastalık şiddeti	Zarar derecesi	Hastalığa yakalanma oranı	Hastalık şiddeti	Zarar derecesi
Adana	0,04	0,02	0,02	0,01	0,004	0.003
Antalya	4,83	2,06	1,33	13,85	6,54	4,00

halde, Antalya topraklarında yaygın olarak bulunmasıdır. Bunun yanı sıra iki ildeki inokulum potansiyellerinin ve azda olsa tuz oranlarının farklılığıda bu sonucun nedeni olabileceği kanısına varılmıştır.

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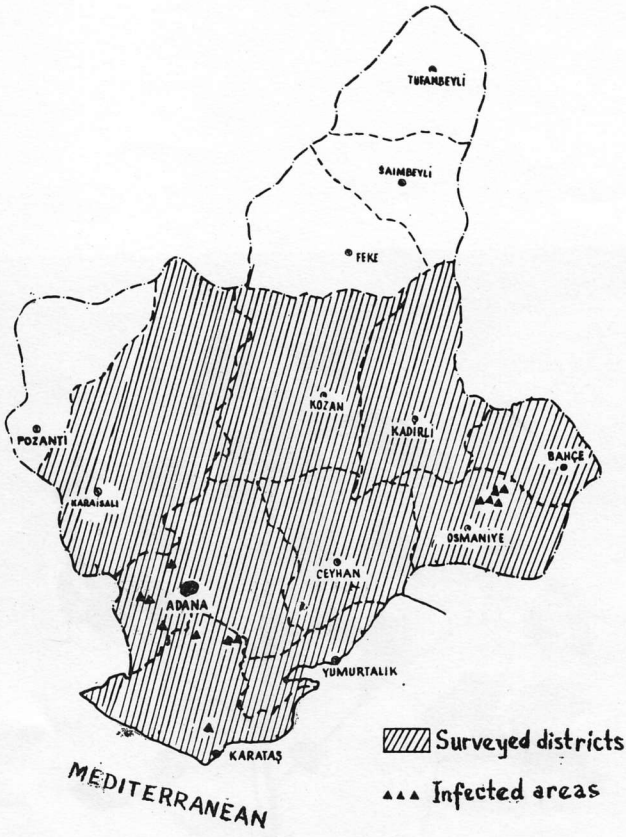
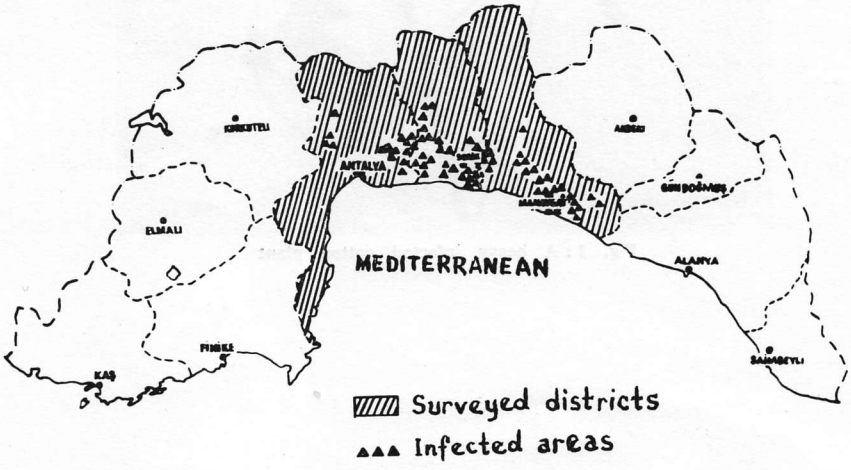
Fig. 1 : A heavy infected cotton plant



Map. 1. Surveyed districts in Adana in 1970 and 1971



Map 2. Surveyed districts in Antalya in 1970 and 1971

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A Preliminary Study on the Cross - Inoculations of the Isolates of Verticillium dahliae Kleb. Obtained from Various Hosts

Mustafa COFÇU **Coşkun SAYDAM**

Regional Plant Protection Research Institute, Bornova, İzmir, TURKEY

A B S T R A C T

The isolates of **Verticillium dahliae** Kleb. obtained from Cotton, Eggplant, Chili, Tomato, Okra, Sesamum and Melon, tested on Eggplant. Chili and Tomato seedlings.

The varieties Kemer, Dolmalık and Supermormende of Eggplant, Chili and Tomato were used for these inoculation studies which were found as a susceptible varieties previously.

All the isolates were found as a pathogen on the Eggplant while the Sesamum and Tomato isolates were nonpathogenic on the Tomato and Chili respectively.

This study presented that there was not a definite specialization between hosts and pathogens particularly on Eggplant seedlings. But the further experiments should be done in order to confirm these results under more controlled conditions.

INTRODUCTION

The wilt disease of Cotton and several vegetables caused by **V. dahliae** Kleb. has been important and pathogen newly recorded on the Kidney-bean from the Salihli Region in Turkey (SAYDAM et al., 1974).

Several studies were done on the chemical control of wilt diseases and some of them managed (KHOKHRYAKOV and BENKEN, 1968; ZHABINSKAYA, 1968; BIEHN, 1970 a, b; BOOTH and RAWLINS, 1970; MAT-

TA and GARIBALDI, 1970; POPOV et al., 1970; ZBARSKI, 1970). But chemical control is not practice because of both uneconomics and difficulties in application techniques.

In addition of the crop rotation, growing of resistant varieties and removing of the diseased plant residues are main cultural practices in the controlling of wilt diseases (KHOKHRYAKOV and BENKEN, 1968; KARACA, 1969).

But the same crops such as Eggplant, Chili, Tomato etc. are grown continual in spite of these reccommendations because of the habits of the grow ers and more incomes in the Ege Region. Therefore the determination of the behaviours of several isolates of the fungus obtained from different hosts, on the various crops, is important for showing whether there is a specialization or not, as a part of the survival of **Verticillium dahliae** Kleb. in the Ege Region.

MATERIAL AND METHOD

In this pot experiment Chili (**Capsicum annum** L.), Tomato (**Lycopersicon esculentum** L.) and Eggplant (**Solanum melongena** L.) plants were taken as the hosts of **V. dahliae.** The isolates of the fungus obtained from Cotton, Eggplant, Chili, Tomato, Okra, Sesamum and Melon were used in the inoculation tests.

Isolations of the fungus were made from the pieces of each plant which were surface sterilized in 01 % $HgCl_2$ for 1 min. and then placed on the 08 % water agar medium. After incubation at 22 C° for 7 days all the cultures were examined and pathogen was transplanted to the agar slant (PDA).

Mycelial bland technique based on WILES (1952) was used for inoculation of the plants. Two mycelial mats obtained after ten days growth each on 50 ml Sucrose-Nitrate Medium (KAMAL and WOOD, 1956) were blended in 200 ml distilled water for 1 min.

The susceptible varieties of Chili and Eggplant had been determined as Dolmalık and Kemer respectively in the last studies (MACİT ve SAYDAM, 1970; SAYDAM and COPÇU, 1972). But it was unknown the reaction of Tomato varieties. Therefore a preliminary test was carried out on the reactions of Tomato varieties by using Chico III, ES 58, Merglobe, Roma F, Roma VF, Supermormende and VFN 8 varieties and Supermormende was taken for the cross-inoculation studies.

After the inoculations plants have observed continouusly, thus the date of first symptoms was determined. The main observations were made on 37th day after inoculation according to the scale of STAFFELD-FRYXELL (1955) and the disease degree was obtained by Index formula and made statistical analyses.

RESULTS AND DISCUSSION

In the cross-inoculation tests first wilt symptoms were observed 16 days after inoculation on Tomato and Eggplant seedlings although appeared 33 days

on Chili plants. These observations showed that the Eggplant is a more acceptable test material which produced quick, visible and satisfactory wilt symptoms than Tomato and Chili.

The results of the determinations made on 22,37 and 60 days after inoculation were shown at Table 1,2 and 3 respectively.

It is possible to see that the whole isolates are pathogenic on the Eggplant seedlings (Fig. 1) and also can be seen that only Tomato, Eggplant and Melon isolates are pathogenic on Tomato seedlings and their incidence degree vary 0.5 to 2.1 index values (Table 1).

Table 2 shows that all isolates are pathogenic on the three hosts with the exception of Tomato isolate on Chili and Cotton and Sesamum isolates on Tomato are nonpathogenic. The incidence degree of the wilt disease varries 0.1 to 3.3 index values on this date.

After 37th day obtervations Eggplant seedlings removed for various reasons and only Tomato and Chili seedlings were examined and determined. on 60th day. The final observations show that Sesamum isolate on Tomato and Tomato isolate on Chili are nonpathogenic (Table 3). The incidence degree of the disease varries 0.2 to 3.8 index values.

All of the results particularly from the Eggplant seedlings show that there is not a specialization between host and pathogen. But various isolates obtained from several hosts resulted different degrees on the same host, show that a significant difference on the virulence of the isolates. According to the disease incidence obtained on Eggplant seedlings after 22 days of the inoculation, Melon, Tomato and Okra isolates were more virulant than the others. The statistical analyses made after 37 days of the inoculation also confirmed that the high virulance of Melon and Tomato isolates.

On the other hand the symptoms of the disease were resulted by only Tomato, Melon and Eggplant isolates on Tomato seedlings after 22 days of the inoculation. This result also revealed that the high pathogenicity the certain isolates as mentioned above.

The isolates of Melon, Tomato and Eggplant had also a similar high virulance on the 37th and 60th day observations on the Tomato seedlings, and all of the isolates showed a less virulance than the other tests made on Eggplant and Chili. The Sesamum isolate was nonpathogenic to the Tomato plants on all of the observation dates.

The isolates of Okra, Melon, Eggplant, and Chili had a high virulance on Chili seedlings both on 37th and 60th day counts. But Tomato isolate was determined as a nonpathogenic or avirulent strain on the Chili seedlings.

The analyses of variance applied on 37th day's index values showed that the interaction host x pathogen was significant. According to these analyses the virulance of the isolates of Okra, Chili,

Table 1. **The wilt degrees of Eggplant and Tomato seedlings obtained on 22 th day after inoculation (index values).**

Hosts / Isolates	Eggplant				Tomato			
	Replications			Average	Replications			Average
	I	II	III		I	II	III	
Chili	0.7	1.0	2.0	1.2	0.0	0.0	0.0	0.0
Cotton	1.3	1.3	0.3	1.0	0.0	0.0	0.0	0.0
Eggplant	1.0	1.7	0.7	1.1	0.0	0.3	1.3	0.5
Melon	1.3	1.7	3.0	2.0	1.0	1.7	1.0	1.2
Okra	2.0	2.0	0.7	1.6	0.0	0.0	0.0	0.0
Sesamum	1.7	1.0	1.3	1.3	0.0	0.0	0.0	0.0
Tomato	1.6	2.0	1.3	1.6	2.3	1.0	3.0	2.1

Table 2. **The wilt degrees of Eggplant, Tomato and Chili seedlings obtained on 37 th day after inoculation (index values).**

Hosts / Isolates	Eggplant				Tomato				Chili			
	Replications			Average	Replications			Average	Replications			Average
	I	II	III		I	II	III		I	II	III	
Chili	2.0	3.0	3.0	2.7	0.0	0.3	0.3	0.2	2.3	1.0	0.3	1.2
Cotton	2.0	2.7	3.3	2.7	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1
Eggplant	1.7	3.0	2.7	2.5	0.7	1.3	1.7	1.2	1.3	1.0	1.0	1.1
Melon	3.3	2.7	3.3	2.7	2.0	2.7	1.7	2.1	0.7	1.3	0.7	0.9
Okra	2.7	3.0	1.3	2.3	0.3	0.0	0.7	0.3	1.3	2.0	1.3	1.5
Sesamum	2.3	2.0	2.3	2.2	0.0	0.0	0.0	0.0	0.7	1.0	0.7	0.8
Tomato	3.0	2.3	3.7	3.0	2.3	3.0	1.0	2.1	0.0	0.0	0.0	0.0

Table 3. **The wilt degrees of Tomato and Chili seedlings obtained in 60 th after inoculation (index values).**

Hosts / Isolates	Tomato				Chili			
	Replications			Average	Replications			Average
	I	II	III		I	II	III	
Chili	0.0	0.3	1.7	0.7	4.0	2.0	4.0	3.3
Cotton	0.0	0.7	0.0	0.2	1.7	0.0	0.0	0.6
Eggplant	1.7	3.3	3.7	2.9	3.3	3.0	4.0	3.4
Melon	4.0	3.3	3.3	3.5	3.8	3.3	3.3	3.5
Okra	1.0	1.0	0.7	0.9	3.3	4.0	4.0	3.8
Sesamum	0.0	0.0	0.0	0.0	1.0	2.3	2.7	2.0
Tomato	3.0	3.0	3.3	3.1	0.0	0.0	0.0	0.0

Tomato and Melon were different on each host by the 1 % level than the other isolates. They also showed that the isolates of Cotton, Eggplant and Sesamum were more virulent on Eggplant seedlings than their virulances on the Chili and Tomato plants and there wasn't a difference between their virulances on Chili and Tomato. This result was confirmed by the several workers. Similar experiments were made by different isolates on Tobacco (TAYLOR, 1969) and by Melon isolate on different hosts (CIRULLI, 1969) and the host specialization was not obtained. But some workers presented that there was a specialization on the pathogenicity of the fungus. ORELLANA (1969) showed that susceptible Sunflower varieties were infected by the isolates from different hosts although Potato, Tomato, Safflower and Cotton varieties known to be susceptible to **Verticillium** wilt, were resistant to Sunflower isolates.

It is necessary to say the studies should be progressed to present definite results on the specialization and virulance of the isolates. In our opinion the conditions of experiment place were not most favourable for infection particularly from the view of relative humidity and temperature and the study was made under a lot of uncontrolled factors. BARROW (1970) presented that the differences between the Cotton strains were masked when daily temperature were above 24.5 C° following inoculation of **Verticillium albo-atrum** and showed that accurate clasification of the plant reactions required controlled temperature, inoculum concentration of 10^6 conidia/ml, and sufficiently mature plants to permit free movement of conidia in xylem vessels after inoculation. SCHOOLEY and BUSCH (1970) studied on Potato wilt and found that the inoculated plants produced symptoms when grown at a day-length of 10 hr but not 16 hr. Although maintenance of the pathogenicity of The **Verticillium** isolates was found for 15 years on agar media (MOREAU and PERESSE, 1969), the isolates used in this experiment were grown for different months and this reason may influence on the results. Therefore this study should be repeated under controlled environmental conditions by same old isolates and certain inoculum concentrations.

As a result it is possible to say that the survival of the pathogen does not seem to be a problem according to these results. Because the same crop or host plants used inoculation tests, are cultivated in the same field or at a very short intervals in the Ege Region.

ÖZET

ÇEŞİTLİ KONUKÇULARDAN ELDE EDİLMİŞ VERTICILLIUM DAHLIAE KLEB. İSOLATLARI İLE BAZI KONUKÇULARDA ÇAPRAZ BULAŞTIRMA DENEMELERİ

Günden güne konukçu listesi genişleyen ve son olarak Börülcede de saptanan solgunluk etmeni **Verticillium dahliae** Kleb. fungusunun Bamya, Biber, Domates, Kavun, Pamuk, Patlıcan ve Susam'dan elde edilmiş isolatlarının, duyarlı Patlıcan, Biber ve Domates fidelerindeki krosinokulaslonunu saptamayı amaçlayan bu çalışma, laboratuvar koşullarında saksı denemesi olarak yürütülmüştür.

Duyarlı Domates varyetesinin tesbiti için Chico, ES 58, Merglobe, Roma F, Roma VF, Supermormende ve VFN 8 olmak üzere 7 varyete **V. dahliae** Domates isolatı ile bir ön teste alınmış ve domates varyetelerinin duyarlılıklarının farklı olmadığı görülmüştür. Bu ön testde en yüksek solgunluk şiddeti gösteren Supermormende Domates varyetesi ile duyarlılıkları önceki çalışmalarla belirlenmiş olan Kemer Patlıcan ve Dolmalık Biber çeşitleri esas krosinokulasyon çalışmasına materyal olarak alınmıştır.

Misel Daldırma Yöntemi'ne göre uygulanan inokulasyondan 16 gün sonra Patlıcan ve Domateste, 33 gün sonra Biber fidelerinde ilk solgunluk simptomları gözlenmiştir. Bu gözlemler **V. dahliae** ile yapılacak laboratuvar testlerinde Patlıcan bitkilerinin, çabuk, belirgin ve yeterli solgunluk simptomu oluşturmaları yönünden Domates ve Biber bitkilerine oranla daha uygun bir test materyali olduğunu göstermişir.

İnokulasyondan 37 gün sonra saptanmış hastalık şiddetleri üzerine uygulanan istatistiki analizler, isolatların virulanslarının, test bitkilerinin duyarlılıklarının farklı olduğunu ve konukçu x patojen interaksiyonunun önemliliğini ortaya koymakla beraber, kontrol edilemeyen birçok koşul altında yapılmış olan bu denemenin sonuçları hakkında kesin bir kanıya gidilmemiş ve sadece patojenisite yönünden özellikle Patlıcan fidelerindeki veriler ele alınarak bir konukçuya özelleşmenin olmadığı anlaşılmıştır.

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Fig. 1. The appearance of the pathogenicity of the several isolates of **Verticillium dahliae** on the eggplant seedlings (1 — Okra, 2 — Chili, 3 — Tomato, 4 — Melon, 5 — Cotton, 6 — Eggplant, 7 — Sesamum).

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Incidence of Zinc Deficiency on Satsuma Mandarin Trees in Izmir

Savaş ERCİVAN

Regional Plant Protection Research Institute, Bornova, İzmir, TURKEY

INTRODUCTION

A noticiable zinc deficiency on Satsuma Mandarin (**Citrus unshiu** Marc.) trees has been observed in İzmir. Zinc Deficiency was found as a serious problem causing to defoliation and small fruits.

Affected trees had been crafted on the «**Poncirus trifoliata**» rootstocks. The symptoms of Zinc Deficiency can be seen on leaves of spring shoots.

This papier includes the results of the survey made for entablishing the percentages of disease in different growing areas.

MATERIALS AND METHODS

The regular surveys were done on the Zinc Deficiency of Satsuma Mandarin Plantations of İzmir in August-November, 1972. In the establishing the degree of Zinc Deficiency the observations were based on the leaf symptoms (Fig. 3).

Soil factory such as pH, K_2O, P_2O_5, Saturation, $CaCO_3$, Based on these soil factors the Satsuma Plantations were separeted in four different groups as follows :

The surveys were done on 5000 trees in İzmir. Eight shoots of each tree

Groups	Number of soil factors	Places
A	0	— —
B	1	— —
C	2	Urla, Çeşme, Bayındır
D	3	Bornova, Dikili, Foça, Karaburun, Karşıyaka, Menemen, Ödemiş, Selçuk
E	4	Merkez, Torbalı
F	5	Seferihisar

Scale Degrees	Determination of the Zinc Deficiency degrees
0	There is no yellowish spot on the leaves and color is normally green.
1	Particular cholorotic aereas between the leaf veins.
2	There are cholorotic spots in middle degree between the right and left lateral veins.
3	Midrib and lateral veins are green. Other aereas of the leaves cholorotic. Leaf margin become narrow or small.
4	Only midrib is green. Other section of leaves become yellow fully. The inner surface of the leave become narrow or small excessively.

were taken to make use of counting. Four of them had fruit. The others were non-fruited shoots. Five leaves from fruited shoots and ten (from 8 years old trees) or 8 (from 10 years old or older) leaves of other shoots were used of counting (Fig. 1,2).

The scale (0-4) was applied for these spring leaves (Fig. 3).

The percentage and the intensity of Zinc Deficiency were found by Index and Mc Kinney Formula for different groups separetely.

RESULTS AND DISCUSSION

As a final result average of the diseased trees percentage and intensity of the Zinc Deficiency were established for İzmir. These are 4,30 %-0,65 % respectively. The percentage and the intensity were found 7,53 %-and 1,03 % in Seferihisar. These results were the highest.

On the other hand the percentage and intensity of fruited shoots were found lower than non-fruited shoots (0,10 %-082 % and 0,30 %-2,33 % respectively).

General results of this survey were collected on the Map of İzmir (Fig. 4).

It's difficult to say any thing about relation between the Zinc deficiency and age of trees. Several ecological conditions may be influence according to my observation. This deficiency was found

more prevalent on the 4-15 years old trees.

According to the results Zinc Deficiency is in low degree in İzmir. But it is in the highest level in Seferihisar among the four groups.

A further study should be done on this problem in this region.

ÖZET

İZMİR'DEKİ SATSUMA MANDARİNLERİNDE GÖRÜLEN ÇİNKO NOKSANLIĞININ ŞİDDETİ ÜZERİNDE ÇALIŞMALAR

İzmir İli Satsuma Mandarin (**Citrus unshiu** Marc.) Plantajlarında görülen Çinko noksanlığının yaprak simptomları esas alınarak survey yapılmıştır. Bu çalışmada toprak faktörüne «Bölümlü Örnekleme» metodu tatbik edilmiştir. Bölge noksanlık verebilecek faktörlerin uygun değerlerini ihtiva eden 5 büyük gruba ayrılmıştır.

Surveyde meyvalı ve meyvasız sürgün yapraklarına 0-4 ıskalası uygulanarak sayım yapılmıştır.

Sonuç olarak İzmir İli için Hastalık şiddeti % 4,30 ve Yakalanma oranı % 0,65 bulunmuştur. Gruplar içinde ise % 7,53 Hastalık şiddeti ve % 1,03 Yakalanma oranı değerleri ile Seferihisar önemli bulunmuşur.

Seferihisarda problem olan bu konu üzerinde daha detaylı çalışmalar yapılması gerekli ve faydalı görülmüştür.

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Greateful tranks are due to Dr. İbrahim KARACA, Professor of Phytopathology, The University of Ege, for giving this project and helping some problems. Tranks are also due to Dr. İdris KOVANCI, Docent of Plant Nutration, The University of Ege.

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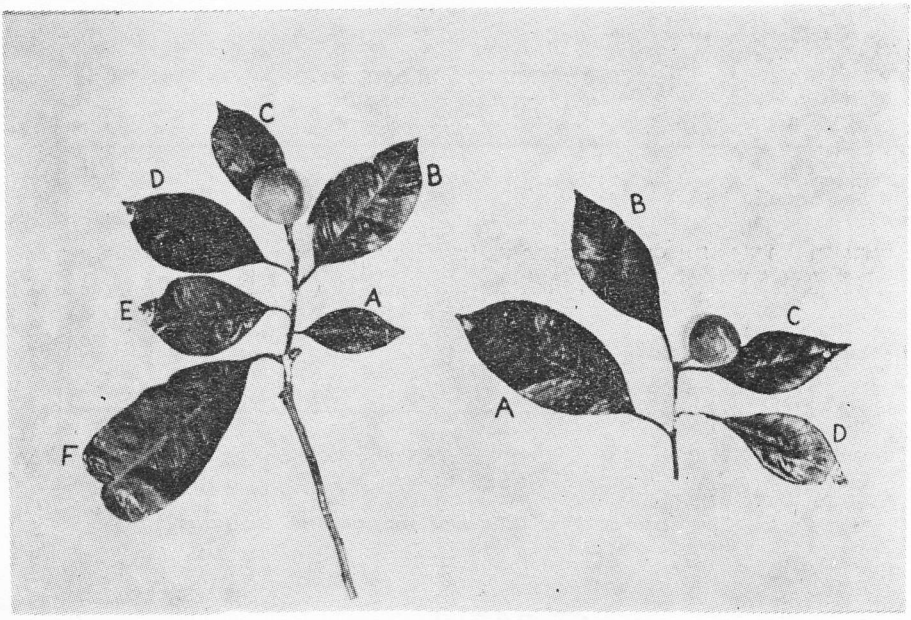

Fig. 1. Fruited shoots to make use of counting

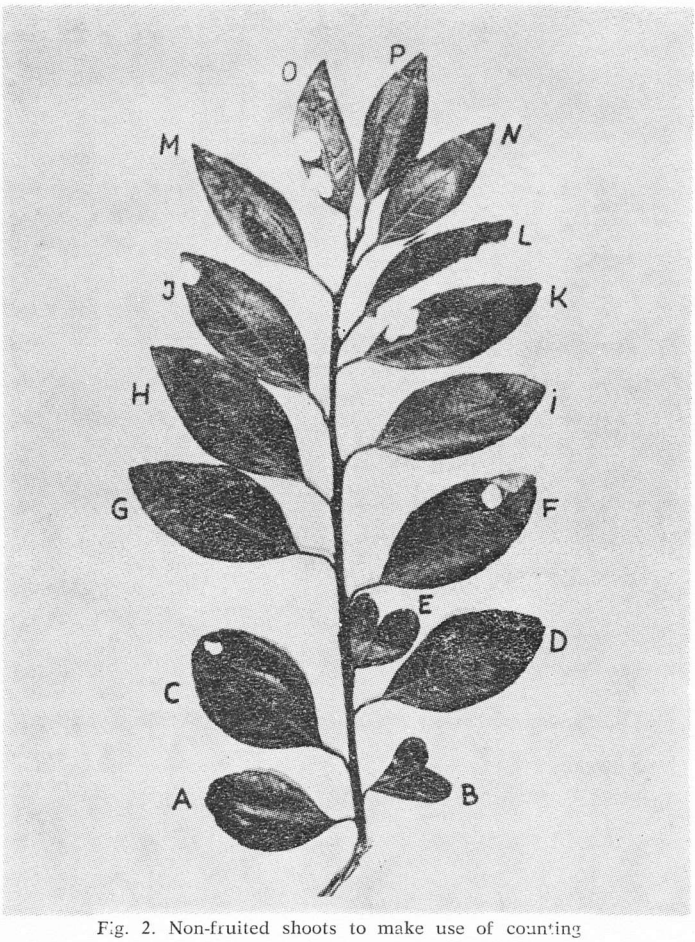

Fig. 2. Non-fruited shoots to make use of counting

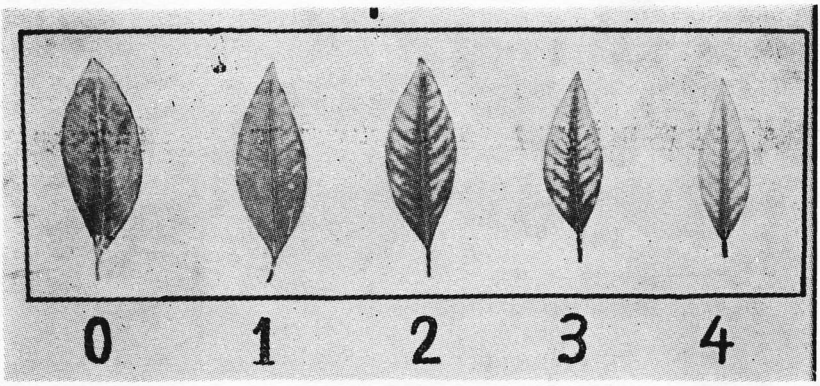

Fig. 3. The scale of Zinc Deficiency symptoms on the leaves

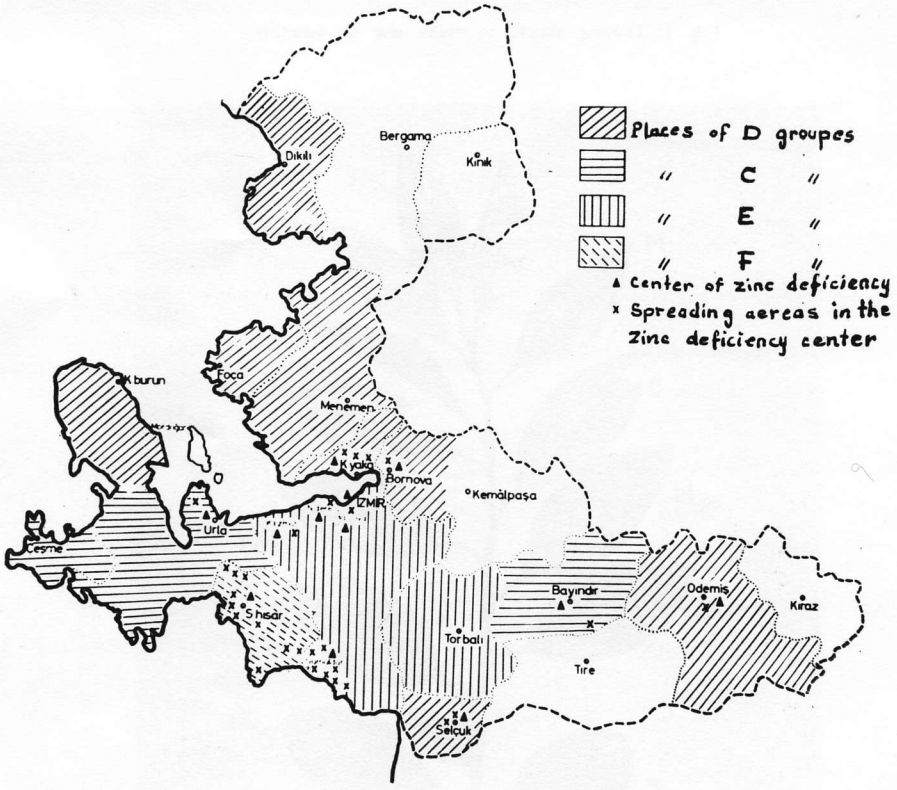

Fig. 4. The map showing the result of Zinc Deficiency survey

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The Determination of Weed Species, Their Frequency Germination and the Competition Between Weeds and Cotfon for Mineral Nutritions in Cotton Fields of Menemen

İlknur SERİM

Biological Control Research Station, Antalya, TURKEY

A B S T R A C T

This investigation has been done in Menemen in order to establish the species of weeds and their percentage of occurence in irrigated and unirrigated cotton fields. Also it is done for inspecting the seed germination of the weeds, and the competition between weeds and cotton for mineral nutritions.

INTRODUCTION

Menemen is an important cotton growing area in Ege Region. In Menemen on totaly 90.000 - 110.000 decars of area cotton is cultivated under irrigated and unirrigated conditions.

Weeds occur in cotton fields have been rivals of cotton as regards area, moisture, light, mineral nutritions. With the effect of weeds the quality and quantity of cotton production have been decreased. CRAMER (1967) has been informed that in our country the losses due to weeds are 5 %.

The important weeds occur in cotton fields depending on the condition of soil and climate in cotton fields of California are **Echinochloa crus-galli** (L.) Beauv, **Digitaria sanguinalis** (L.) Scop., **Eragrostis** sp. **Amaranthus albus** L., **Chenopodium album** L., **Tribulus terrestris** L., **Portulaca oleracea** L., **Sorghum halepense** (L.) Pers., **Cynodon dactylon** (L.) **Solanum** sp. (MILLER and FOY, 1956).

According to the other writers have been informed that the mostly seen weeds

in cotton fields are **Amaranthus** sp., **C. album, P. oleracea, Solanum nigrum** L., **S. halepense, C. dactylon, Phragmites communis, Tribulus terrestris, E. crusgalli, E. colonum, Setaria verticillata** (L.) Beauv., **Eragrostis cilianensis** (All.) Lutati, **Cyperus distans** (BRADLEY, 1968; BAKUMENKO, 1969; MICHAILICHENKO and FAIZIEV, 1969).

Weeds compete with cultural plants in respect to water, mineral nutritions and the area which they have covered.

VENGRIS et al (1955) has been investigated the competition of N,P,K, Ca,Mg between corns and weeds.

SCHWEREL and THOMAS (1970) investigated the competition between weeds and cotton. Weeds have uptaken more water and N.K.Mg from soil than the cotton has.

The seeds of **Cynodon dactylon, Sorghum halepense, Eragrostis spp., Setaria italica** (L.) Beauv., **Echinochloa crus-galli, Amaranthus** spp., **Heliotropium** spp., **Solanum** spp. germinate more easily with alternative temperature and with the addition of % 0,02 KNO_3.

In the germination of seeds of **C. dactylon, Amaranthus** spp., **Heliotropium** spp. light is effective (MANTARA and HASAHARA, 1941; DRAKE, 1951; Editorial and Rules Committees, 1960).

MATERIALS AND METHODS

This investigation has been carried-out in irragated and unirigated cotton fields in Menemen and its villages.

Weeds, their seeds, stolons, rhizoms have been used as materials.

Survey has been mode in order to determine the weeds and their frequency in the cultivated cotton area in Menemen.

During the survey 95 fields have been visited. Seventy five of 95 fields were under irrigated and 20 fields were under unirrigated conditions. A quadrat of 1 m^2 have been used in order to count and determine species in each field.

To analyse weeds for mineral nutritions the species of weeds have been dried and ground. From these dry matter, ash, total N.Na,K,Ca,Mg and P determination have been made.

The collected weed seeds have been investigated for the germination. Results have pointed out in per cent. The germination studies have been carried out in constant and alternative temperature degree in light and dark; and with or without addition of KNO_3 %.

RESULTS AND DISCUSSION

A survey has been made in the irrigated cotton fields of 19 villages in Menemen. According to this survey the species and the frequency of weeds have been shown on the table 1.

The results of the survey made in the unirigated cotton fields of Aliağa and Güzelhisar have been shown on the table 2.

In the irrigated cotton fields the frequency of perennial weeds were more

Table 1. The weed species and their frequency (%) the irrigated cotton fields of Menemen

Weeds	1968	1960	Average
Cyperus rotundus	20.03	20.93	20,48
Setaria verticillita	13,17	13,57	13,42
Sorghum halepense	9,28	10,17	9,72
Xanthium strumarium	10,09	9,36	9,72
Digitaria sanguinalis	9,05	8,50	8,77
Cynodon dactylon	8,16	8,25	8,20
Chenopodium album	6,62	6,56	6,59
Portulaca oleracea	4,06	3,41	3,73
Echinochloa crus-galli	3,63	3,74	3,68
Salsola kali	2,54	2,38	2,46
Tribulus terrestris	2,04	2,58	2,31
Alhagi camelorum	2,06	2,42	2,24
Eragrostis cilianensis	2,01	1,92	1,96
Amaranthus albus	1,82	1,95	1,88
Convolvulus arvensis	1,91	1,67	1,79
Phragmites communis	1,72	1,06	1,39
Glycyrrhiza glabra	0,53	0,30	0,41
Amaranthus retroflexus	0,38	0,31	0,34
Chrozophora tinctoria	0,14	0,40	0,27
Solanum nigrum	0,16	0,13	0,14
Heliotropium europaeum	0,14	0,12	0,13
Chenopodium urbicum	0,11	0,15	0,13
Xanthium spinosum	0,09	0,04	0,06

important. Like **Cyperus rotundus, S. halepence** and **C. dactylon.** Among annuals **Setaria verticillata** and **Digitaria sanguinalis** were important, and also **Xanthium strumarium** and **Chenopodium album** were important, too.

Cynodon dactylon and **Convolculus arvensis** show higest frequency in the unirrigeted cotton fields and the following species is **Chrozophora tinctoria.**

25 weed species have been determined in Menemen. Those are **Portulaca olaracea,** L., **Chenopodium album** L., **Chenopodium urbicum** L., **Salsola kali** L., **Amaranthus albus** L., **Amaranthus retroflexus** L., **Hypericum triquetrifolium** Turra., **Glycyrrhiza glabra** L., **Alhagi camelorum** fisch., **Tribulus terrestris** L., **Chrozzophora tinctoria** (L.) Raf., **Convolvulus arvensis** L., **He-**

Table 2. The weed species and their frequency (%) in the unirrigated cotton fields of Menemen

Weeds	1968	1969	Average
Cynodon dactylon	46,34	45,74	46,04
Convolvulus arvensis	38,68	39,05	38,86
Chrozphora tinctoria	6,84	5,52	6,18
Heliotropium supinum	2,05	2,85	2,45
Xanthium spinosum	1,44	1,99	1,72
Amaranthus albus	1,57	1,35	1,46
Hypericum triquetrifolium	1,57	1,66	1,36
Chenopodium album	1,42	1,27	1,34
Cyperus rotundus	0,50	0,47	0,48
Phragmites communis	0,04	0,06	0,05

liotropium supinum, H. eurapaeum L., **Solanum nigrum** L., **Xanthium strumanium, X. Spinosun** L. **Phragmites communis** Trin., **Eragrostis cilianensis** (All.) Lutati., **Cynodon dactylon** (L.). **Echinochlea crus-galli** (L.) Beauv., **Digitaria sanguinalis** (L.) Scop., **Setaria verticillata** (L.) Beauv. **Sorghum halepense** (L.) Pers., **Cyperus rotundus** L..

Germination experiments have been carried-out with the seeds in constant temperatures (15,18,21,24,27,30,35 C°) and light; in dark with the temperatures 24, 27 C°; in altenative temparatures like 20 - 30 C°, 20 - 35 C° and also with the addition of KNO_3. The results of these experiments have been given one by one for each species in per cent.

The results of germination experiments have been summariazed in the following.

C. album, A. albus, S. nigrum, C. dactylon, S. verticillata and **S. halepense** seeds germinated in the best with alternative temperatures and with KNO_3.

For **P. olerancea, C. album, A. albus, A. retroflexus, G. glabra, C. tinctoria S. nikrum, E. cilianensis** and **D. sanguinalis** constant temperatures are the most effective.

Generaly ligth effects the germination more than dark. And the best temperatures for germination are 27,30 C°.

Cyperus rutondus have not germinated at all., **P. communis** have germinated by change, and **E. crus-galli** seeds have germinated irregularly.

Analyses have been done with 14 weed species in order to research the competations. The percentage of dry matter and N %, P %, Na %, Ca %, Mg %, K % have been determined.

According to our analysis **Echinochloa crus-galli, Salsola kali,** and **C. rotundus** have less P % than that of cotton but other 11 weed species have mo-

re P % than cotton (Fig. 1). This means weeds use P more than cotton. It examine the competition bewteen weeds and cotton, **Chrozophora tinctoria, Sorghum halepense, Cynodon dactylon,** and **Cyperus rotundus** have less K % than that of cotton and other 10 weed species have more K % than cotton has (Fig. 2). K is necessary for fibre formation in cotton structure.

Cotton have more Na % than weeds (Fig. 3) for this reason there is no competition between weeds and cotton.

Also, according to our experimente weeds competition with cotton from point of view of % Ca. can be seen on Fig. 4.

If we compare weeds and cotton for Mg %, **Chrozophore tinctoria,** and **Cynodon dactylon** have less Mg % than cotton has. But other weeds have more Mg % than cotton (Fig. 5).

Also, according to our analysis **Xanthium strumarium, Echinochloa crus-galli Sorghum halepense,** have less N % than cotton has, but other weeds have more N % than cotton (Fig. 6). This means from point of view N % weeds competitor to cotton, too, As it is known that N is necessary from vegetative structure in plants.

In these analysis mineral nutritions of weeds are richer than cotton. So it has been understood that their needs of water and mineral matter are more than the needs of cotton

Weeds have more dry matter %, P %, Ca %, Mg %, Total N % and immature protein than cotton have. For this reason weeds are the competitor with cotton. They consume more nutritions from soil than that of cotton. So cotton producton decreases.

ÖZET

MENEMEN PAMUK TARLALARINDAKİ YABANCI OTLARIN TÜRLERİNİN VE SIKLIK DERECELERİNİN SAPTANMASI, ÇİMLENME ORANLARI VE MİNERAL BESLENME YÖNÜNDEN PAMUKLA REKABETLERİ ÜZERİNDE ARAŞTIRMALAR

Ege Bölgesi'nin önemli pamuk sahalarına sahip Menemen yöresinde 1968 ve 1969 yıllarında yapılan bu araştırmada sulanan ve sulanmayan pamuk tarlarında :

Portulaca oleracea, L., **Chenopodium album** L., **Chenopodium urbicum** L., **Salsola kali** L., **Amaranthus albus** L., **Amaranthus retroflexus** L., **Hypericum triquetrifolium** Turra, **Glycyrrhiza glabra** L., **Alhagi camelorum** fisch., **Tribulus terrestris** L., **Chrozophora tinctoria** (L.) Raf., **Convolvulus arvensis** L., **Heliotropium supinum, H. eurapaeum** L., **Solanum nigrum** L., **Xanthium strumarium** L., **X. Spinosum**

L., **Phragmites communis** Trin., **Eragrostis cilianensis** (All.) Lutati., **Cynodon dactylon** (L.), **Echinochlea crus-galli** (L.) Beauv., **Digitaria sanguinalis** (L.) Scop., **Setaria verticillata** (L.), Beauv. **Sorghum halepense** (L.) Pers., **Cyperus rotundus** L. olmak üzere 25 yabancı ot saptanmtştır.

Bu yabancı ot tohumlarının değişik koşullarda (sıcaklık, ışık ve KNO_3) yapılan çimlendirme testleri.

C. album, A. albus, S. nigrum, C. dactylon, S. verticillata ve **S. halepense** tohumlarının alternatif sıcaklıklar ve KNO_3 ilavesinden en iyi çimlendiğini;

P. oleracea, C. album, A. albus, A. retroflexus, G. glabra, C. tinctoria, S. nigrum E. cilianendis ve **D. sanguinalis** için ise sabit sıcaklıkların en etkin olduğunu göstermiştir.

Yine bu testlerde genellikle ışığın etkisi karanlıktan fazla olmuş ve çimlenme için en uygun sıcaklıklar 27 ve 30 C° olarak saptanmıştır.

Ayrıca bu araştırmada yabancı otlarla pamuk arasındaki mineral beslenme rekabeti, N, P, K, N, C ve Mg yönünden incelenmiş ve genellikle yabancı otların pamuğa oranla daha fazla N, P ve Mg kullandıkları ve Na yönünden bir yarışmanın olmadığı görülmüştür. Yabancı otların kuru madde, P, C, Mg, toplam N ve ham protein yüzdeleri bakımından pamuktan daha zengin bulunmaları, mineral beslenme üstünlükleri ile pamuk verimini azaltacak şekilde zararlı olduklarını ortaya koymuştur.

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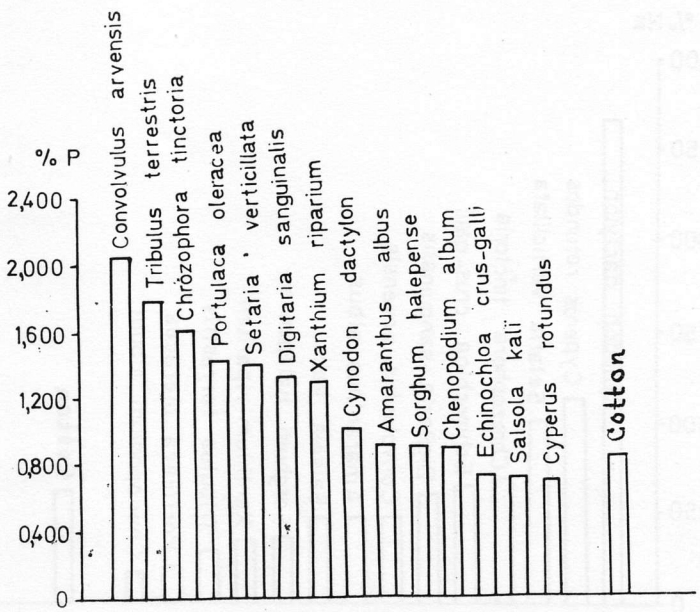

Fig. 1. P % in weeds and cotton

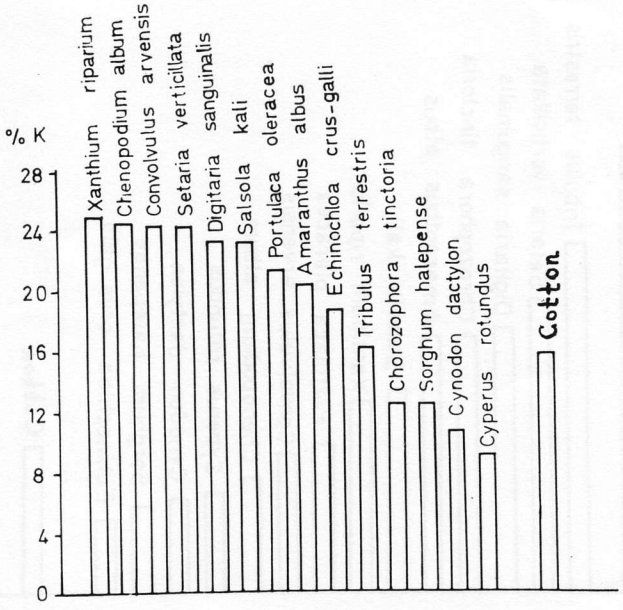

Fig. 2. K % in weeds ana cotton

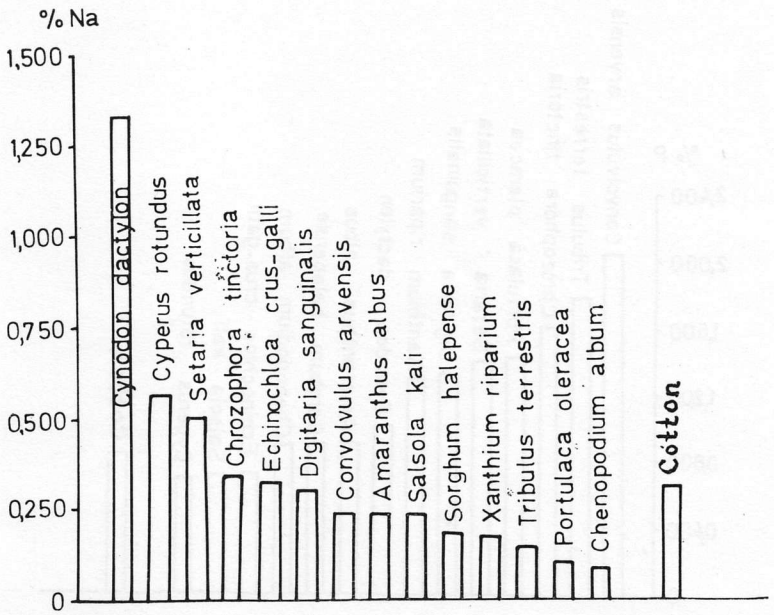

Fig. 3. Na % in weeds and cotton

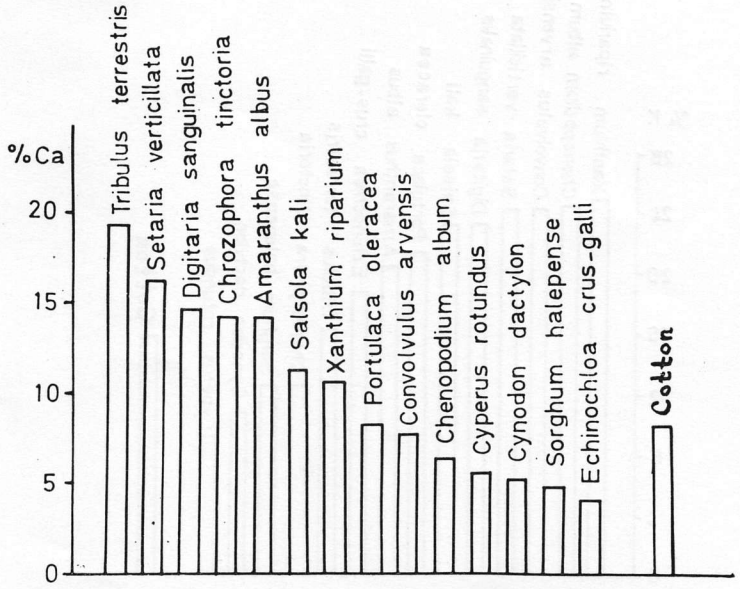

Fig. 4. Ca % in weeds and cotton

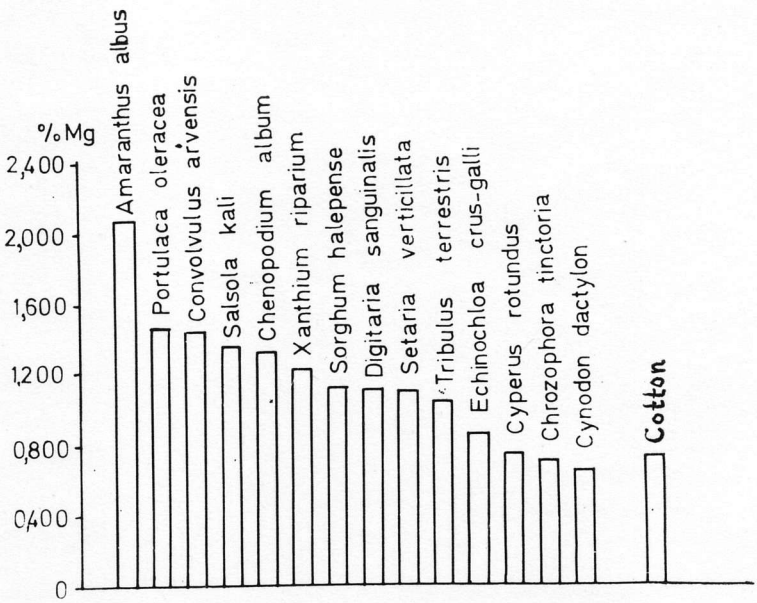

Fig. 5. Mg % in weeds and cotton

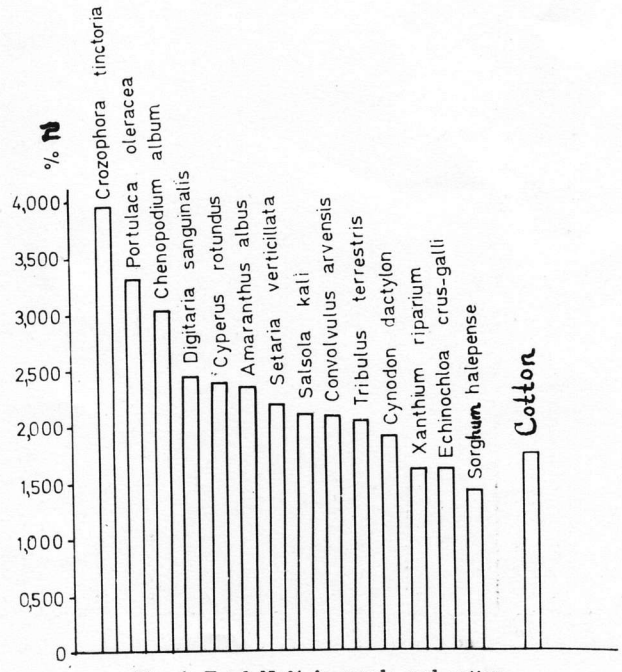

Fig. 6. Total N % in weeds and cotton

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Viruskrankheiten der Kirschen in Afyon

Seyhan KURÇMAN

Institüt für Pflanzenkrankheiten, Ankara, TÜRKEI

ZUSAMMENFASSUNG

Die im Freiland und im Gewächshaus durchgeführten Versuche führten zum Nachweis der Kirchenkrankheit in Afyon. Die Kirschbaume wurden vom März bis Ende Juni besichtigt und die Krankheit der Süsskirsche wurde auf Pfirsichsämlinge übertragen.

Die Symptome auf den Kirschenbäumen vom Fundort und die Testergebnisse zeigten, dass die Kirschenbäume in Afyon mit Virus infiziert sind. Die unterschiedlichen Erscheinungen können durch die Kirschenringfleckenviren vor allem durch das nekrotische Ringfleckenvirus (es verursacht die Stecklenberger Krankheit der Sauerkirsche und die nekrotische Ringfleckenkrankheit der Süsskirsche), Pfeffinger Krankheit oder durch ein Virus-Gemisch verursacht werden. In folgenden Jahren werden eine Reihe von Versuchen zur Differenzierung der Viren angelegt.

EINLEITUNG

Im Kirschanbaugebiet von Afyon tritt seit langer Zeit eine Krankheit an Kirschen auf, die eine grosse wirtschaftliche Bedeutung hat. Die Bäume von unterschiedlichen Alters sterben jedes Jahr ab. Sie ist meistens auf Unverträglichkeit zwischen Reis und Unterlage, ungünstige Bodenverhäaltnisse und zu tiefes Einpflanzen zurückgeführt worden.

Die Krankheit wurde von vielen einheimischen und ausländischen Forschern beobachtet und ihre Ursache blieb ungeklärt.

Im Sommer 1972 wurden verdächtige Kirschblätter von Afyon in unser Institüt geschickt. Sie zeigten kleine oder grosse, runde ringförmige oder eckige Flecken, Nekrosen und Löcher.

Im Jahre 1973 wurde die Krankheit von Afyon beobachtet und untersucht.

MATERIAL UND METHODIK

Als Indikatorpflanze der Viruskrankheit wurden einjährige Pfirsichsämlinge **(Prunus persica** L.), Gurke **(Cucumis sativus** L.) Gänsefüsse **(Chenopodium quinoa, C. amaranticolor, C. murale),** Tabak **(Nicotiana tabacum** Sorte «Samsun» und «Xanthi») verwendet.

Die Sämlinge wurden im Freiland überwintert, im Februar nach starkem Rückschnitt (4-5 Augen) getopft. Im Gewächshaus wurden sie 10 Tage bei Temperaturen um 5-10 °C und anschliessend über 20 °C aufbewahrt.

Im März 1973 wurden in 4 Gärten von Afyon (Dereçine), 20 verdächtige Süsskirschenbäume (auf die der Besitzer hinweis) gekennzeichnet. Von jedem Baum wurden aus verschidenen Teilen der Krone 3-4 Reiser entnommen. Für jeden des zu prüfenden Baum. wurden 3 Pfirsichsämlinge verwendet. Die Inokulation erfolgte vor dem Entfalen der Knospen. Von den Reisern der zu Prüfenden Pflanze und von den Indikatoren wurden zungenförmige Rindenstücke ohne Auge ausgeschnitten. Die Rindenstücke von der zu testenden Pflanze wurden auf die Pfirsichsämlinge eingepasst und mit Bast umwickelt. Auf jeden Indikator wurden 3 Rindenschildchen der zu testenden Reiser inokuliert. Jedes Stück wurde auf dem Indikator unter ein Auge gepfropft. Die Inokulierten Pflanzen wurden erst nach 10 Tagen bonitiert und die Entwicklung der Symptome in 2-3 tägigen Abständen beobachtet.

Mitte April wurden von jedem markierten Baum wieder 3 Reiser entnommen. Die gerade austreibenden oder entfaltenden Blattknospen wurden mit 1/15 mol Sörensen Phosphatpuffer pH 8 zermörsert und der Blattpressaft mit dem Finger auf die Blätter der Indikatorpflanzen mit Hilfe des Karborund verrieben. Die Inokulierten Blätter wurden mit Leitungswasser abgespült und im Gewächshaus (über 20 °C) aufbewahrt. Von 5 Bäumen wurden 15 Knospen zermörsert und für 5 Bäume wurden 12 Indikatorpflanzen verwendet. Die Inokulierten Pflanzen wurden jeden Tag boniert.

Die identifizierung wurde im grunde nach literatür gemacht (1,2,3,4, 5,6,7,8,9,10,11,12,13,14).

ERGEBNISSE UND DISKUSSION

Freiland Untersuchungen.

Anfang Mai zeigten sich auf den Blättern der diesjährigen Triebe oder der Seitentriebe von Sauerkirsche ringförmige Aufhellungen, Flecken und nekrotische Ringe (Abb. 1). Die Interkostalfelder in den Blättern aufgewälbt und es sind noch nekrotische Ringflecken zu sehen. Diese Erscheinungen wurden bei (5), (14), (9), (1) als nekrotische Ringfleckenvirus (Stecklenberger Krank-

heit) bezeichnet. An den Trieben zeigten sich rosettenartige Anordnungen der Blüten ,Abb. 2). An den kranken Bäumen waren deformierte und partial aufgehellte Blätter. An den Süsskirschblättern bildeten sich ölfleck-und mosaikartige Flecken und Aufhellungen.

Ende Juni entwickelten sich auf den Süsskirschblättern chlorotische oder braune Ringe, Nekrotischringflecken, band und eichenblattförmige Linien (Abb. 3). Diese Erscheinungen sind typisch für die Ringfleckenkrankheit der Süsskirsche (5, 14, 9).

Die Sauerkirschblätter zeigten mosaikartige Aufhellungen und Durchlöcherung (Abb. 4).

Einige Süsskirschblätter waren an den Blatträndern heller gefärbt. In der Blätter wurden begrenzte dunkelgrüne Zonen festgestellt (Abb. 5). Auf der Unterseite der kranken Blättern wurde eine stärkere Behaarung beobachtet.

Die Sauerkirschblätter waren klein, missgebildet und stark deformiert und hingen rosettenartig an den Zweigen Auf Unterseite des Sauerkirschblattes wurden blätchenähnliche Enationen und braun köpfige Auswüchse festgestellt Einige obengenannte Symptome wurden bei (10,11), (6), (14), (9) als Pfeffinger Krankheit und bei (5), (9) als Stecklenberger Krankheit beschrieben.

Wenn die Enationen auf der Blattunterseite mit anderen typischen Pfeffinger Symptomen erscheint, dann besteht an der Pfeffinger Krankheit kaum ein Zweifel (14).

In Afyon wiesen auch Kirschjungpflanzen die bleichen Erscheinungen auf. An der Blatttunterseite auf 2-jährigen Jungpflanzen traten Enationen längs der Mittelrippe (Abb. 6). Die Blätter zeigten Aufhellungen und waren deformiert. Der Zuwachs von krank bonixtierten Jungpflanzen war geringer obwohl sie nebeneinander standen. Es wurde festgestellt, dass die kranken Edelreiser im gleichen Kirschbaumbestand von einem stark erkrankten Baum Stammt. Diese Beobachtung zeigt, dass die Krankheit durch ein Virus verursacht wurde und die Übertragung erfolgte in diesem Fall durch Pfropfung.

Der Wuchs und die Ertragleistung der stark infizierten Bäume war sehr herabgesetzt und die Bäume sahen wie Ruinen aus. Solche Bäumen sterben allmälich ab,

Die Krankheit wurden an jungen und alten Bäumen festgestellt und alle Stadien des Befalls wurden in diesem Verbreitungsgebiet gefunden.

Gewächshaus Untersuchungen :

Auf einigen Pfirsichblättern entwickelten sich 20 Tage nach der Inokulation leichte mosaikartige Flecken und Aufhellungen. An den gleichen Indikatorpflanzen wurden später Blattmissbildung, Triebstauchung, Rosettenbildung und eine leichte Triebspitzennekrose festgestellt. Die Blätter waren verschmälert. Die Triebspitzennekrose ist typisch für die Symptome der nekrotischen Ringfleckenkrankheit (Baumann 3, Kegler 7, Marenaud und Bern-

hard 12). Triebstauchung von infizierten Pfirsichsämlingen wurden durch das chlorotisch-nekrotische Ringfleckenvirus verursacht (7).

Kegler et al. (8) wiesen auf, dass Pfeffinger Virus nur durch Inokulation von **P. persica** eliminiert werden kann, weil Pfirsichsämlinge für dieses Virus nicht anfällig sind.

An den als krank bonitierten Indikatoren blieben Triebstauchung, Rosettenbildung und Blattmissbildung erhalten. Mosaikartige Flecken an den Blättern sind nach einiger Zeit maskiert.

An krautigen Intikatorpflanzen wurden keine Symptomen festgestellt.

Die Symptome auf den Süss-und Sauerkirschbäumen vom Fundort und die Testerfebnisse zeigten, dass die Kirschbäumen mit Virus infiziert sind. Die unterschiedlichen Erscheinungen können durch die Kirschenringfleckenviren vor allem durch das nekrotische Ringflecken Virus, Pfefinger Krankheit oder durch ein Virus Gemisch verursacht werden. Das nekrotische Ringflecken-Virus verursacht die Stecklenberger Krankheit der Sauerkirsche und die nekrotische Ringfleckenkrankheit der Süsskirsche (7,4).

Mit den Erscheinungen vom Fundort und mit diesen Testergebnisse war die Differenzierung der Kirschenviren in diesem Jahr nich möglich. Im folgenden Jahren werden zur Differenzierung der Viren eine Reihe Versuche angelegt.

ÖZET

AFYON'DA KİRAZLARIN VİRUS HASTALIKLARI

Bu çalışma Afyon ilindeki ağaç kurumalarının etmeninin virus olup olmadığının saptanması için ele alınmış, vişne ve kirazda virus hastalıklarının en iyi görülebileceği devrelerde bahçeler tetkik edilerek, kirazda nekrotik halka leke, vişnede nekrotik halka leke (Stecklenberger hastalığı), Pfeffinger hastalığı veya bir virus karışımının meydana getirebileceği belirtiler tesbit edilmiştir.

Serada da bir yıllık şeftali çöğürlerine, hastalığından şüphe edilen ağaçlardan alınan kalemlerden kabuk aşılanmış ve aşılama sonucu, şeftali çöğürlerinde nekrotik halka leke ve klorotik nekrotik halka leke virus hastalığı belirtilerine benzer belirtiler görülmüştür. Ancak bu yıl otsu test bitkilerine yapılan aşılamalardan sonuç alınamamıştır.

Bahçe tetkikleri sırasında Afyon'da fidandıklar da gözden geçirilmiş ve 1-2 yaşındaki vişne fidanlarında virus hastalığı belirtileri görülmüştür. Hasta fidanların genellikle yan yana dizilmiş bulunması, aynı bahçede aşı kalemlerinin alındığı ağacın hasta olduğunun tesbit edilmesi, hastalık etmenin virus olduğu ve hastalığın orada aşı kalemi ile bulaştığı kanaatını vermiştir.

Test ve tetkik sonuçları, Afyon'da kiraz ve vişne ağaçlarının virus hastalıkları ile bulaşık bulunduğunu göstermiştir. Ancak etmenin hangi virus olduğu önümüzdeki yıllarda yapılaçak çalışmalarla açıklığa kavuşturulmaya çalışılaçaktır.

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Abb. 2. Rosettenbildung an der erkrankten Sauerkirschbäumen.

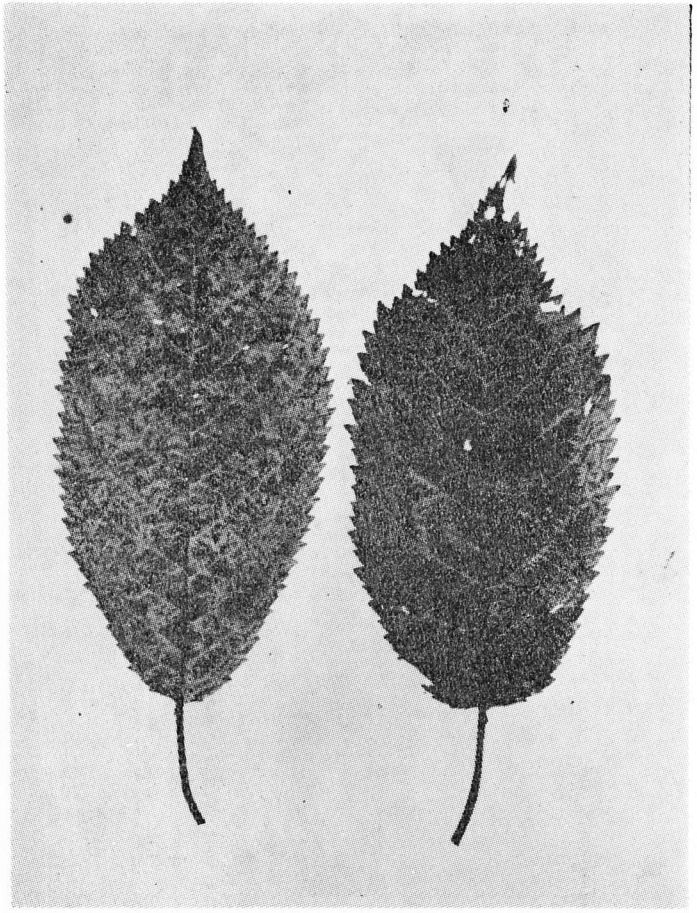

Abb. 1. Sauerkirschblätter mit Symptomen der Nekrotischringflecken viren.

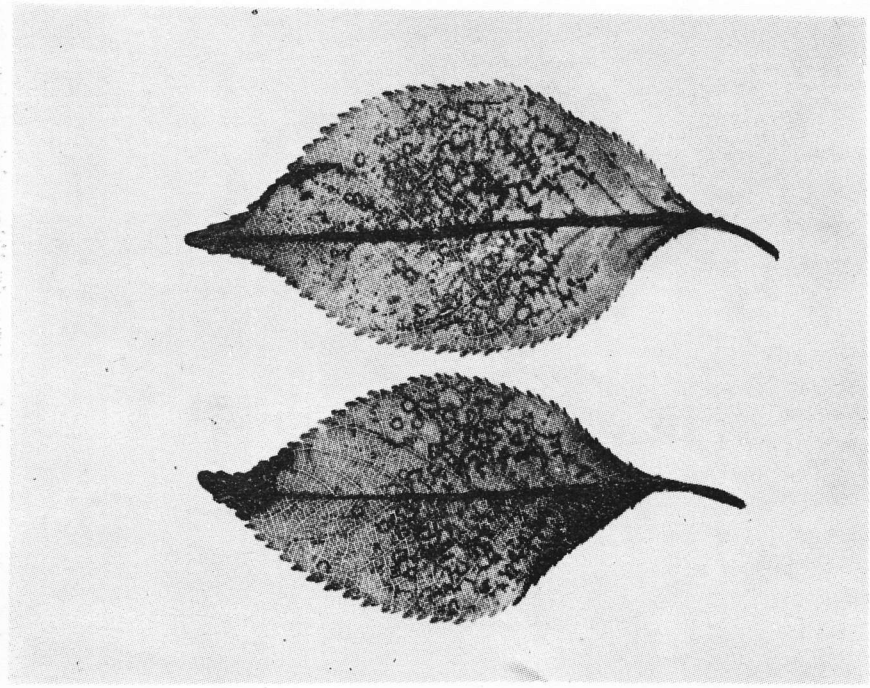

Abb. 3. Ringfleckenkrankheit der Süsskirsche.

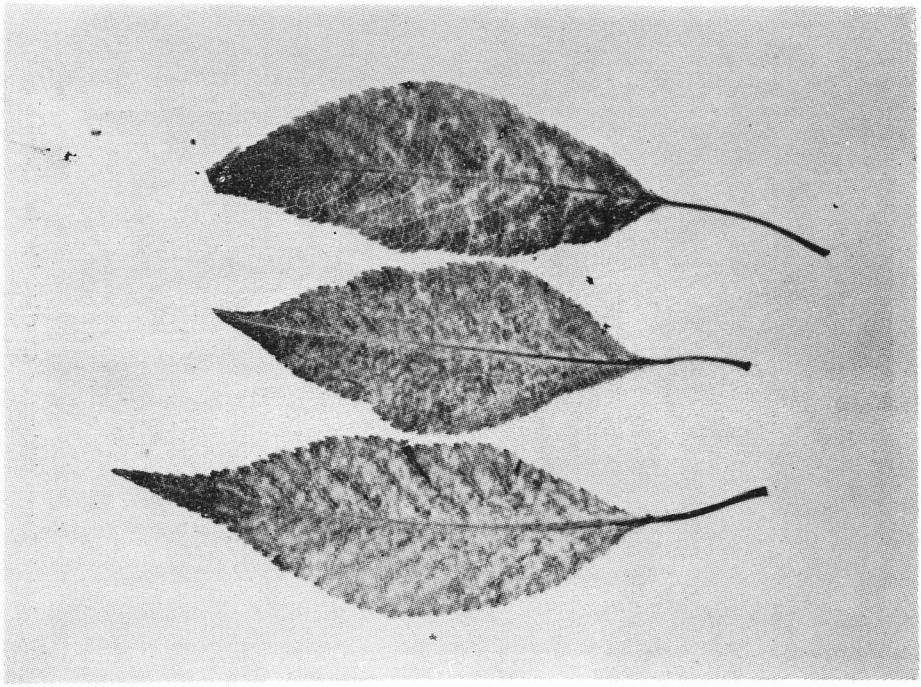

Abb. 4. Mosaikartige Aufhellungen auf Sauerkirschblättern.

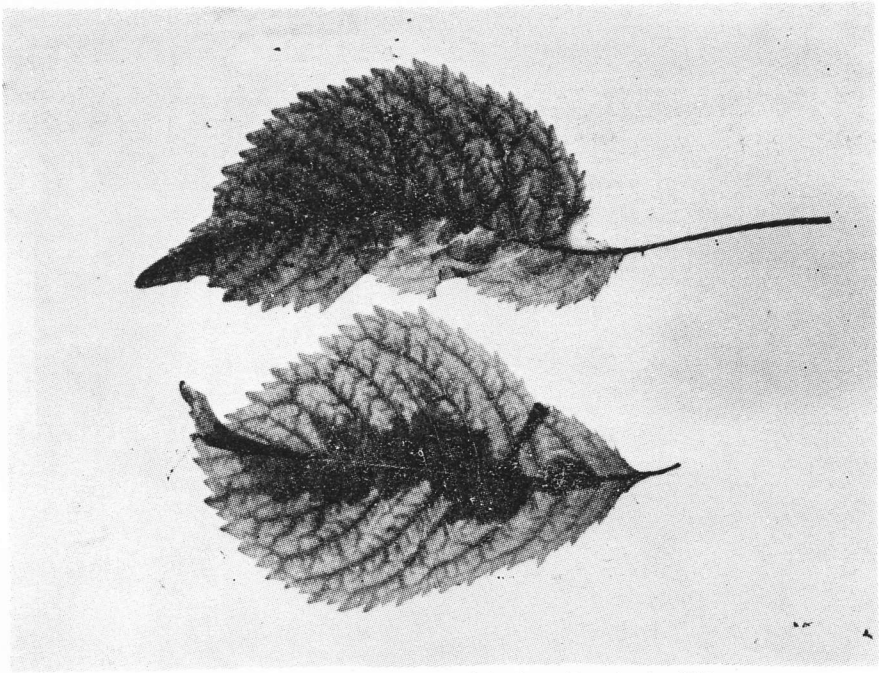

Abb. 5. Süsskirscbblätter mit dunkelgrümer Zone in der Mitte.

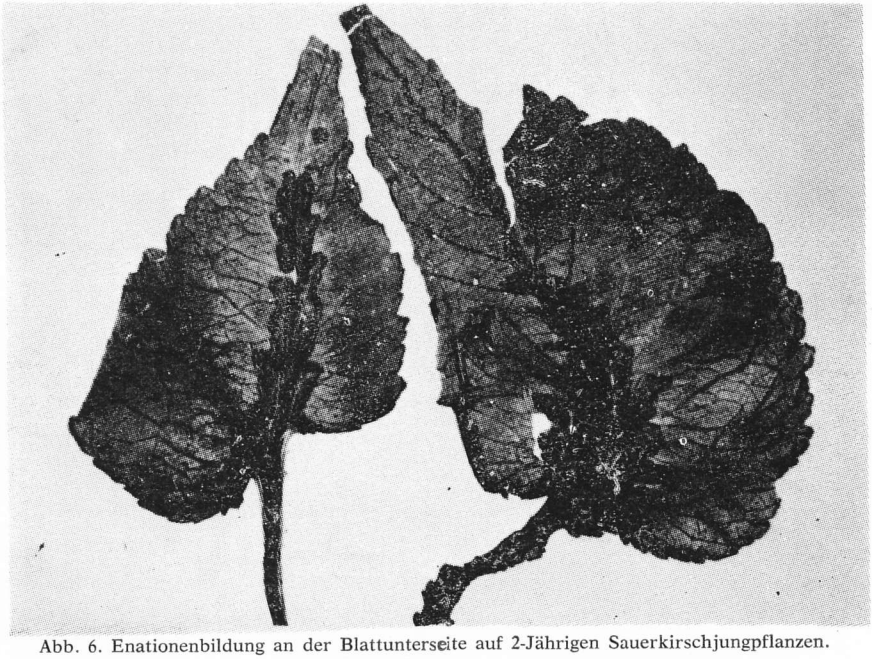

Abb. 6. Enationenbildung an der Blattunterseite auf 2-Jährigen Sauerkirschjungpflanzen.

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Two New Hosts of Verticillium Dahliae Kleb. in Turkey

Coşkun SAYDAM, Mustafa COPÇU and Osman YALÇIN
Regional Plant Protection Research Institute, Bornova, İzmir, TURKEY

The typical symptoms of **Verticillium** wilt on Kidney-bean **(Dolichos sesquipedalis** L.) were first observed in Salihli during a study in September 1973. The symptoms were characterized by stunting of the plants, yellowing and inward rolling of the leaves, marginal drying and wilting. The browning on the cross section of the stem of the affected plants was also other characteristic symptom of the disease.

Isolation studies were done by using standart methods and **Verticillium dahliae** Kleb. was isolated.

Specimens of diseased Melon **(Cucumis melo** L.) plants taken from Saruhanlı showed wilting and vascular browning also yielded **V. dahliae**.

ÖZET

VERTICILLIUM DAHLIAE KLEB.'İN İKİ YENİ KONUKÇUSU

Ege Bölgesi'nde 1973 yılı Eylül ayında yapılan bir çalışma sırasında Salihli'de tipik solgunluk belirtileri gösteren Börülce **(Dolichos sesquipedalis** L.) bitkileri dikkati çekmiştir. Yapraklarda sararma, kıvrılma, yaprak kenarlarındaki kurumalar ve gövde kesitinde renk değişimi şeklinde belirti gösteren bu bitkilerden yapılan isolasyon çalışmaları hastalık etmeni fungusun **V. dahliae** Kleb. olduğunu göstermiştir.

Saruhanlı'da da solgunluk ve kesitlerde renk değişimi gösteren Kavun **(Cucumis melo** L.) bitkilerinden de **V. dahliae** isole edilmiştir.

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A New Bacterial Disease of Almond in Turkey

M. GÜNDOĞDU, S. KÂYA, and Z. TÜRKMENOĞLU
Regional Plant Protection Research Institute, Bornova, İzmir, TURKEY

Almond trees **(Prunus amygdalus)** are widely grown in the south western part of Datça in Turkey, and are one of te main sources of agricultural income for the growers in that region.

During a survey in April 1974, the most characteristic symptoms of the disease are swollen cankers on the affected branches, were first observed in Datça orchards.

The symptoms observed on the trees caused by canker disease were essentially the same as those described by the other workers (2). The affected bark tissues are split apart and open cankers 0,5-2 cm. long and surrounded by swollen, rough, dark brown margins are firmed (Fig. 1,2).

Examination in the bacteriology laboratory at the plant protection Institute, in Bornova, revealed large numbers of bacteria in the diseased tissuses. The samples were taken from the watersoaked areas of the swollen margins of the cankers. Two isolations were carried out, on nutrient agar (Difco) plus % 5 sucrose in April. Pure cultures of a slow growing bacterium were invariably obtained from both old and new cankers.

Using water suspension from young cultures of this bacterium a series of leaf scar and prick inoculations were performed on almond shoots in may. In the following two weeks later cankers typical of the disease were consistently obtained (Fig. 3). From these, the same bacterium was then reisolated. All controls, treated with steril distilled water, remained free from infection.

The resulting bacteria was determined to be **Pseudomonas** sp. because it is gram-negative rod with polar flagella, production of levan, hypersensitivity reaction in tobacco leaves of white Burley (1).

Therefore this constitute is the first report on canker disease of almond in Turkey.

The studies will be expanded on the etiology of this disease as well as the characterization and identification of the causal organism, in order to establish a method of control and the resistant varieties.

ÖZET

TÜRKİYE'DE BADEMLERDE YENİ BİR BAKTERİ HASTALIĞI

Geniş badem ziraatı yapılan Datça ilçesinde 1974 yılı Nisan ayında ki survey sırasında dallarda şivkin kanser yaralarına rastlanmıştır.

Yapılan izolasyonlar sonucu elde edilen izolatlarla sunî inokulasyon yapılarak hastalık simptomu elde edilmiş ve re-izolasyon yapılmıştır.

Bakterinin bir **Pseudomonas** sp. olduğuna levan teşkili ve tütün yapraklarında nekroz meydana getirmesi ile karar verilmiştir.

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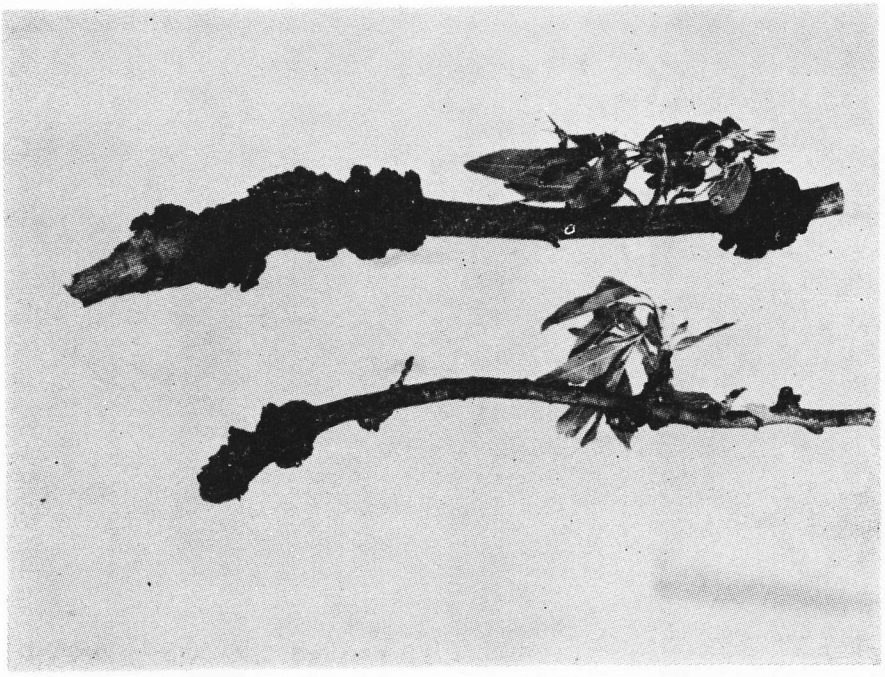

Fig. 1. Symptoms of large cankers on almond branches.

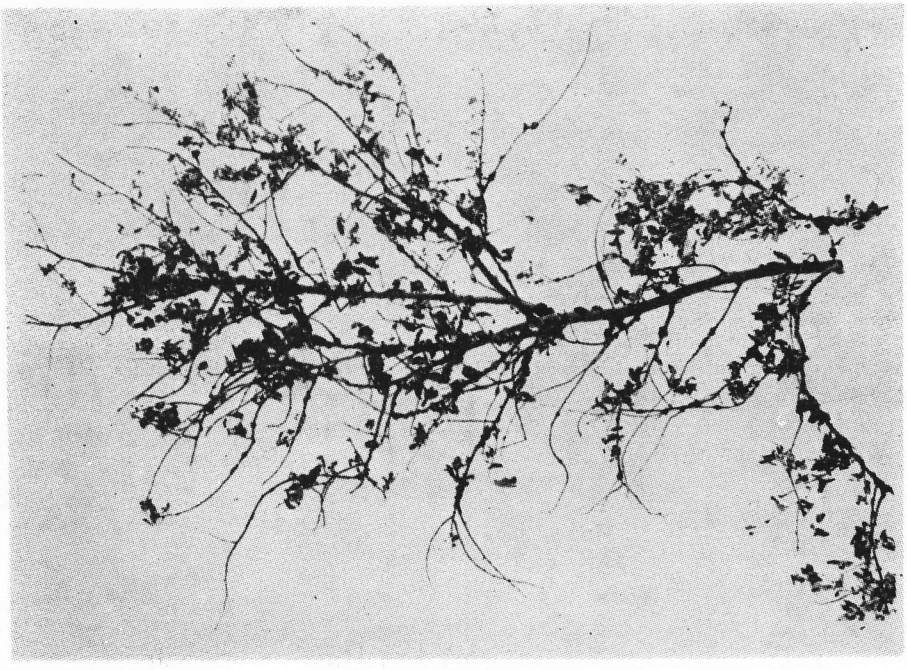

Fig. 2. An Almond branch severely affected by the disease.

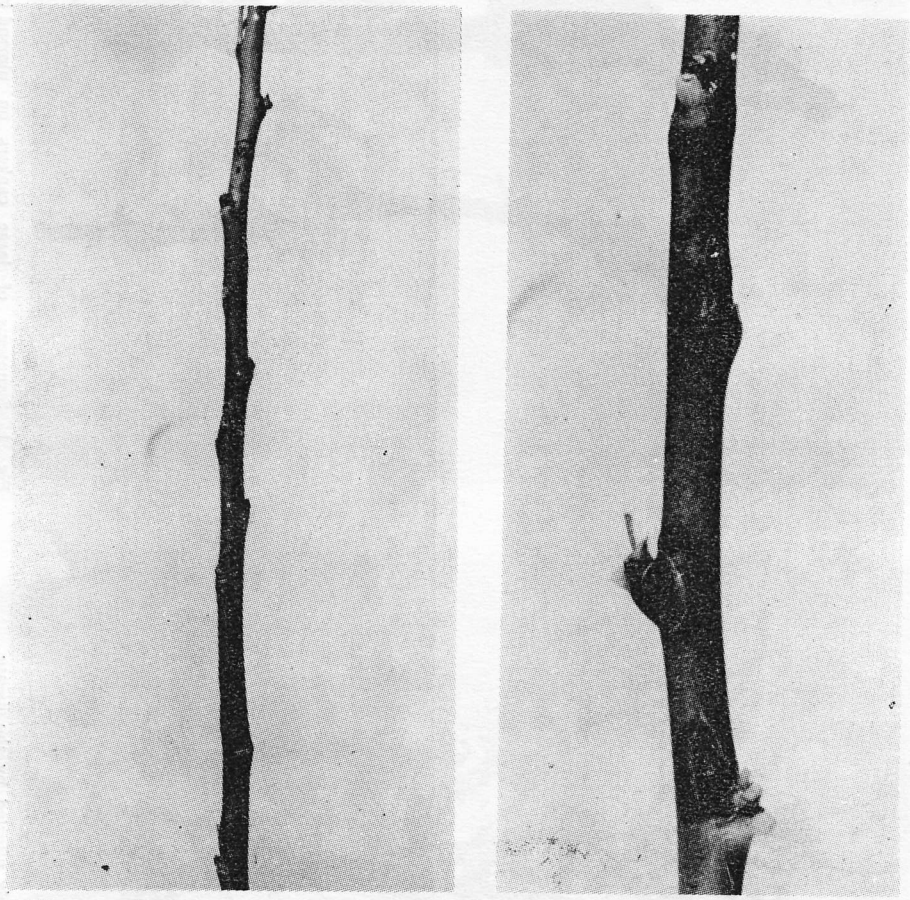

Fig. 3. Young cankers on twigs of almond resulting from artificial prick inoculations with Pseudomonas sp.; control twig on left. Four weeks after inoculation.

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Preliminary Studies on Banana Mosaic (Cucumber Mosaic) Virus Found on Bananas (Musa cavendishii Lam.) in Southern Anatolia

Hasan SALİH and Y. Ziya NAS

Regional Plant Protection Research Institute, Adana, TURKEY

A B S T R A C T

A new disease has been observed in banana plantations in Mediterranean Region of Turkey in 1973.

The causal agent was determined as cucumber mosaic virus.

INTRODUCTION

A new diease called attention for the first time on banana (**Musa cavendishii** Lam.) plants, as drying of the leaves and decaying of the pseudostem in banana plantations in Alanya in 1973. Studies showed that the causal agent of the disease is cucumber mosaic virus.

Due to ecologigal factors banana plantations are adapted to Mid Mediterranean coast where Alanya, Anamur and Gazipaşa are leading production centers. According to the statistics anual total banana production is about 10.000 tons and growing area is 14.000 decars (ANONYMUS, 1971).

Although a survey was not carried out, it may be thought that the disease is important in banana plantations.

Several workers had been studied on the disease (SMITH, 1957; SIMMONDS, 1959; ANONYMUS, 1958; WAITE, 1961; ADAM, 1962; CHAMPION, 1963; MALAN and THOMAS, 1963).

MATERIALS AND METHODS

In order to carry out the inoculation tests, the button-seeds taken from diseased plants were grown in barrels 35

cm in diameter and 33 cm in depth for the stock materials. The infected banana leaves for inoculation tests were taken from plants, grow in barrels at the Plant Protection Research Institute in Adana; and tests were made on Tobacco (**Nicotiana tabacum** L. and **N. glutinosa** L.,) **Chenepodium quinea** L., **C. amaranticolor** L., Cucumber (**Cucumis sativus** L.) Squash (**Cucurbita pepo** L.), and Pepper (**Capsicum annum** L.).

RESULTS AND DISCUSSION

The chief symptom of the disease is a leaf mosaic, chlorotic whitish or yellowish-white streaks or bands, on plants of all sizes (Fig. 1). A yellowish-white streak or necrotic spotting occurs in the leaf midrib futter and petiole (Fig. 2). The disease after results in severe heartrot, the inner leaves of the plants, in which the heart-rot is acute, are broken from the petiole than dry. Leaf emerging from the crown may display severe clorosis and rosetting. Plants that show these symptoms don't produce bunchs and if they produce, fingers appear distorded and pseudostem brown slimy exudate oze from cavities developed in vascular bandles. Brown pockets develop over and under of the pseudostem layers of diseasld plants (Fig. 3).

These symptoms were described by the other workers (SMITH, 1957; ANONYMUS, 1958, 1960; CHAMPION, 1963) and the our identification was also confirmed by Dr. STOVER.

The inoculation tests shiwed characteristic symptoms of cocumber mosaic virus on the indicator plants which were given below :

The cause of the disease is cucumber mosaic virus, and inoculation tests on indicator plants reveald that the cause of the disease is cucumber (banana) mosaic virus.

INDICATOR PLANTS	SYMPTOMS
Nicotiana tabacum	Systemic mottle
« **glatinosa**	« mosaic
Vigna sinensis	Red local lesion
Chenepodium amaranticolor	Chlorotic local lesion
« **quinea**	« « «
Cucumis sativus	Systemic mottle
Cucurbita pepo	« mosaic
Capsicum annum	Necrotic spots

ACKNOWLEDGEMENT

The authors wish to thank Dr. R. K. STOVER in Division of Tropical Research, Tele Railroad Company La Lima Honduras for his help in identi-

fication of the disease, and Dr. Özden ÇINAR, Dr. M. Asil YILMAZ in University of Çukurova, Agricultural Faculty for their helps in tests.

ÖZET

BODUR MUZLARDA (MUSA CAVENDISHII LAM.) GÖRÜLEN MUZ MOZAYİK VİRÜSÜ ÜZERİNDE ÇALIŞMALAR

Güney Anadolu Bölgesinde 1973 yılında Muz bitkilerinde görülen belirtiler üzerine konuya eğilinmiştir.

Hasta bitkilerden alınan rizomlardan mozayik belirtisi görülen fidanlar elde edilmiş ve test bitkileri ile yapılan çalışmalardan da etmenin Hıyar mozayik Virüsü olduğu anlaşılmıştır. Ayrıca Dr. R.H. STOVER de bulgularımızı desteklemiştir.

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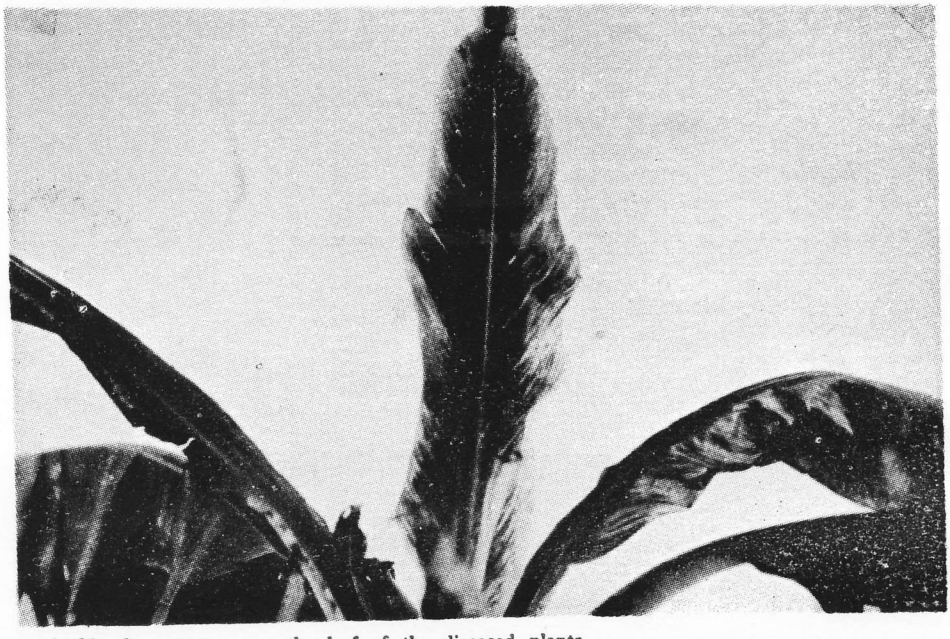

Fig. 1. Mosaic symptoms on the leaf of the diseased plants

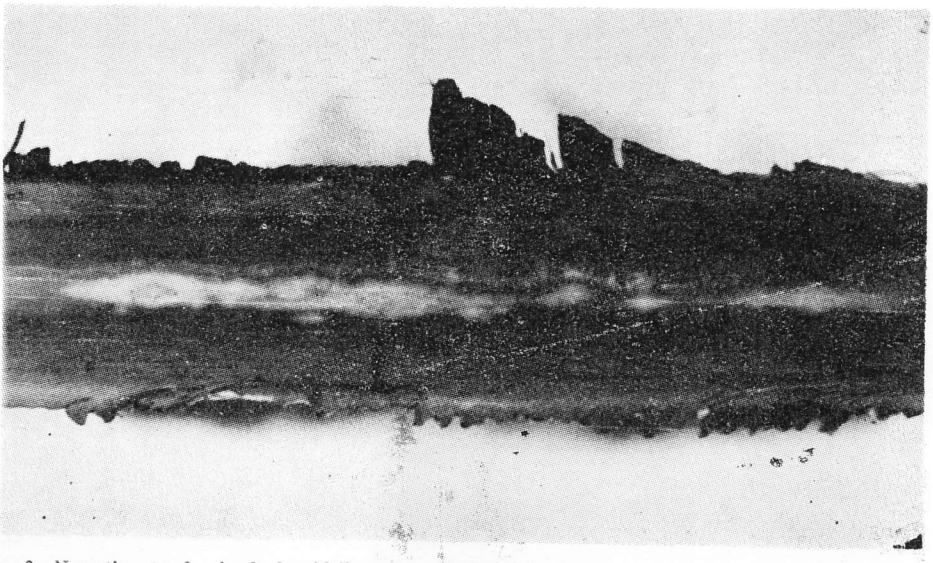

Fig. 2. Necrotic streaks in leaf midrib gutter of diseased plants.

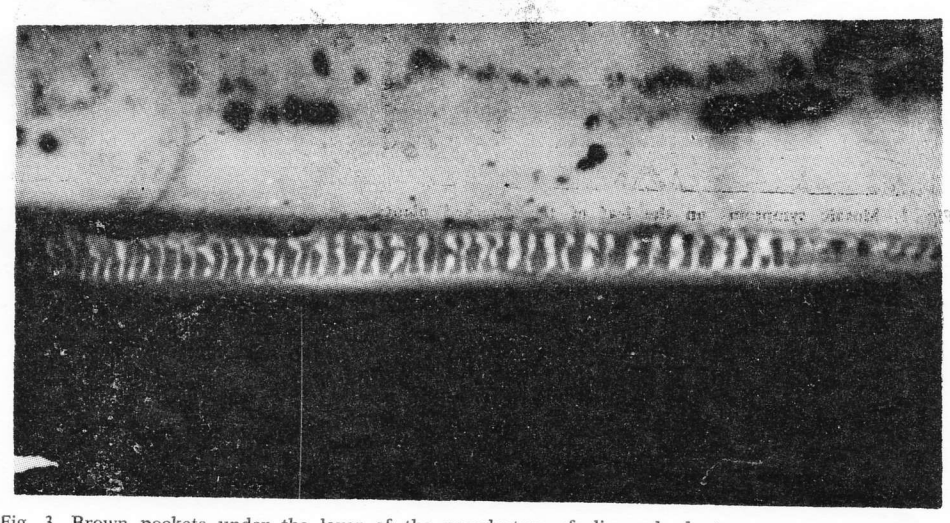

Fig. 3. Brown pockets under the layer of the pseudostem of diseased plants.

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Bitki Koruma Bölümü
Bornova : İzmir, TURKEY