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Identification of Viruses Infecting Vegetable Crops Along the Mediterranean Sea Coast in Turkey[1]

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ABSTRACT

Viruses on vegetable crops grown along the Mediterranean sea coast of Turkey were isolated and identified by means of host range reactions, serological tests, and electron microscopy. Tobacco mosaic, cucumber mosaic, and lettuce mosaic viruses were found to be widely distributed along the coast. Potato virus Y, and Zucchini Yellow mosaic viruses were less widely distributed.

INTRODUCTION

Vegetable crop production along the Mediterranean coast is more intensive than in other areas in Turkey because of a favorable climate, irrigation facilities, and fertile soil. According to reports issued in 1980 and 1981 by the Turkish Statical Institute watermelon, lettuce, bean, and squash production in this region represented about one fourth of the total vegetable crop production in Turkey (5). This is also a leading production region of early vegetables due to the extensive use of glasshouses. The glasshouses are mainly used for tomato and pepper production, and to a lesser extent for eggplant, bean, and squash. Watermelon is also grown to some extent in glasshouses for the early market, although field production is more common.

The abundance of efficient virus vector and virus-susceptible crops are factors which often lead to significant disease outbreaks and major losses in yield (7). The main viruses infecting tomato (**Lycopersicon esculentum** Mill) (7, 8, 9, 11) and lettuce (9), pepper (**Capsicum annum** L.), bean (**Phaseolus vulgaris** L.), lettuce (**Lactuca sativa** L.), and cucumber (**Cucumis sativus** L.) in Turkey have been reported (6).

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Viruses causing losses on watermelon (**Citrus vulgaris** Schard.) and squash (**Cucurbita pepo** L.) have not been reported in the mediterranean sea coast. The objective of this study was to identify viruses of economically important crops by biological assays, serological tests, and electron microscopy. Abstract of this research has already been published (10).

MATERIALS and METHODS

Leaves of tomato, pepper, watermelon, lettuce, and bean, with virus-like symptoms were collected from greenhouses, commercial fields, or experimental plots at fifteen locations along the coast (Figure 1). The samples were lyophilized and brought to the U.S. for identification.

Lyophilized tissue was triturated in a mortar with 0.02 M phosphate buffer, pH 7.2 containing 1 % 2- mercaptoethanol. Sap was inoculated to carborandum dusted leaves of indicator plants (Table 1). Plants were maintained in an insect-free greenhouse.

Ouchterlony double-diffusion tests were used to establish serological reactions (1). Two types of media were used depending on the morphology of the virus : 1) 0.5 % agar (Oxoid, L 28), 1 % sodium chloride (NaCl), 0.25 sodium dodecyl sulfate (SDS), 0.1 % sodium azide (NaN_3), prepared in water for flexuous rods, 2) 0.7 % agar, 0.85 % NaCl, 0.03 % NaN_3, prepared in 0.05 M Tris-HCl, pH 7.2-for spherical viruses. Wells were 7 mm in diameter and 4 mm between edges around a central well. Leaves infected with flexuous viruses were ground 1,1 (w/v) in water and those infested with spherical viruses in Tris-HCl buffer. Expressed sap was placed in peripheral wells and antiserum in the central well. Results were generally recorded after 24 hr.

Fig. 1. The collection sites of samples along the mediterranean coast of Turkey.

Leaves of some virus infected plants were examined by leaf-dip electron microscopy (2). The 200-400 mesh copper grids used were coated with formvar and stabilized with carbon. Samples were stained with 2 % phosphotungstate, pH 7, for 1-2 min. and viewed in a Siemens electron microscopy.

RESULTS and DISCUSSION

Several viruses were identified by their host reactions (Table 1), positive serological reactions, and characteristic particle morphology. Tobacco mosaic virus (TMV) was the most widely distributed virus, occuring at all locations sampled (Table 2). According to symptoms caused by TMV isolates of tomato (Table 3) on the host plants, four different isolates were identified. Three isolates caused very severe mosaic and one isolate induced mild mosaic symptoms on campbells 147 tomato. One out of four isolates had stem necrosis on the yolo wonder pepper. Pepper, tomato, and bean were also found to be infected with the isolate of TMV (Table 4).

Cucumber mosaic virus (CMV) was secondly distributed virus in many locations (Table 2). This virus was isolated mainly from pepper and watermelon plants (Table 4), but also from tomato plants in the Erdemli and Demre region. Potato virus Y (PVY) was isolated from only in a few locations. Zucchini yellow mosaic virus (ZYMV) was recovered from squash and watermelon samples taken at Adana. ZYMV was recently characterized as a member of potyvirus group and were found to be as a systemic diseases of cucurbits plants in other mediterranean country. Italy (4). ZYMV was also reported earlier on squash and watermelon in Turkey (3). Lettuce mosaic virus was isolated from lettuce at a few locations. One virus from bean and one from pepper were not identified yet (Table 4).

Table 1. Reaction of test plants to viruses obtained from various Locations of the mediterranean coast.

Species	VIRUSES						
	TMV	PVY	CMV	LMV	ZYMV	Bean unknown	Pepper unknown
Nicotiana tabacum «Samsun NN»	LLn	Mo	SvMo	-x	-x	-x	-x
N. tabacum «Samsun»	Mo	Mo	SvMo	-x	-x	-x	-x
N. glutinosa	LLn	SvMo	SvMo	-x	-x	-x	-Mo
Capsicum annum «Yolo Wonder»	LLn Str	SvMo	Mo	0	0	-x	(Mo)
C. frutescens «Tabasco»	LLn	SvMo	SvMo	-x	-x	-x	-x
Lycopersicon esculentum «Campbells 147»	Mo SvMo	Mo	Mo, shs Ma	-x	-x	-x	-x
Datura stramonium	LLn	-	(t)	-x	-x	-x	-x
Gomphrena globosa	LLn	(t)	(t)	-x	-x	-x	-x
Phaseolus vulgaris «Black Turtle 2»	Mo	Mo	Mo	-x	-x	Mo	-x
Glycine max «Cutler 71»	-x	-x	-x	-x	-x	O SvMo, LR	
Vigna sinensis «California Cowpea No. 5»	-x	-x	LLn	-x	-x	-x	-x

Cucurbita pepo «Early Prolific, Straightneck»	-x	-x	SvMo	-x	SvMo	-x	-x
Cucumis sativus «National Pickling»	-x	-x	Mo	-x	SvMo	-x	-x
Chenopodium quinoa	LLc	LLc	LLc	LLc	LLc	-x	-x
C. amaranticolor	CLL,LLn	LLn	LLn	LLn	LLn	-x	-x
Lactuca sativa «Oak Leaf»	LLn	-x	-x	Mo	-x	-x	-x
Physalis floridana	SvMo EP	SvMo EP	SvN EP	-x	-x	SvMo TPN	-x

Symptom key; O not tested;-no symptoms; ( ) symptoms variable, not always expressed x not tested by back inoculation; LLc chlorotic local lesion; LLn necrotic local lesion; LR leafroll; Ma malformation; Mo mosaic; Shs shoestrings; Str streak, St stem necrosis; Sv severe; Ep epinasty; Tpn top necrosis; SVN Severe necrosis; (t) not confirmed, serologically.

Table 2. Identification and distribution of viruses isolated from samples collected along the Mediterrenean Coast.

Location	TMV	PVY	CMV	SMV	LMV	ZYMV	Unknown
1 Samandağ	+						
2 Yayladağ	+		+				
3 Ceyhan	+		+	+			
4 Karataş	+	+	+		+		+
5 Adana	+		+	+	+	+	+
6 Tarsus	+				+		
7 Mersin	+				+		
8 Erdemli	+	+	+		+		
9 Ovacık	+						
10 Aydıncık	+						
11 Alanya	+		+				
12 Antalya	+		+		+		
13 Kumluca	+						
14 Finike	+						
15 Demre	+	+	+				

Table 3. Symptoms caused by TMV Isolates.

Species	ISOLATES 1	2	3	4
Nicotiana tabacum «Samsun NN»	NLL	NLL	NLL	Sm
N. Tabacum «Samsun»	SM	SM	SM	SM
N. rustica	NLL	CLL	CLL	—
N. syslvestris	EnLL	EnLL	EnLL	EnLL
Datura stramonium	NLL	NLL	NLL	NLL
Physalis floridana	MEp	MEp	MEp	SVMEp
Capsicum annum «Yolo wonder»	N areas	N areas,StN	NLL,N areas	NLL,Halo
Capsicum frutescens «Tabasco»	NLL	NLL	NLL	NLL
Chenopodium	CLL,NLL	CLL,NLL	CLL,NLL	CLL,NLL
Lycopersicum esculentum	M,SvM	M,SvM	M,SvM	Mm

[a]Symtom Key : C chlorotic; En enlarging; Ep epinastry; LL local lesion; M mosaic; N necrotic; S Systemic; Sm small; St stem; Sv severe

Table 4. Occurence of viruses of vegetable crops in Mediterranean coast.

Plants	TMV	PVY	CMV	ZYMV	LMV	Unkrown
Pepper	+	+	+			+
Tomato	+		+			
Squash				+		
Watermelon			+	+		
Bean	+					+
Lettuce					+	

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Ö Z E T

AKDENİZ SAHİL ŞERİDİNDE YETİŞTİRİLEN BAZI KÜLTÜR BİTKİLERİNDE ZARARLI VİRÜSLERİN SÖRVEYİ VE TANIMI

Akdeniz sahil şeridinde yetiştirilen bazı sebzelerde zararlı virüslerin tanımı serolojik ve biyolojik yöntemlere ek olarak elektron mikroskobu yardımıyla yapılmıştır. Domates **(Lycopersicon esculentum)**, biber **(Capsicum annum)** ve fasulyelerde **(Phaseolus vulgaris)** Tütün Mozayık Virüsü; biber, domates ve karpuzlarda **(Citrullus vulgaris)** Hıyar Mozayık Virüsü, Marulda **(Lactuca sativa)** Marul Mozayık Virüsü; Biberde Patates Y Virüsü, karpuz ve kabakta **(Cucurbita pepo)** Zuccini Sarılık Mozayık Virüsü saptanmıştır.

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Investigations on The Identification, Seed Transmission and Host Range of Viruses Infecting The Culture Plants in The Cucurbitaceae in Marmara Region

2— The seed transmissibilities and cucurbit hosts of CMV and WMV-2 isolated from the culture plants in the Cucurbitaceae

Abdullah NOGAY (1) and Ülkü YORGANCI (2)

ABSTRACT

According to the results of seed and seedling experiments CMV (Cucumber mosaic virus) and WMV-2 (Watermelon mosaic virus-2) isolates obtained from cultured cucurbits of Marmara region were not transmitted by seed of tested cultivars of cucumber, squash, melon and watermelon.

In order to determine their cultured cucurbit hosts, all our isolates were assayed on 14 cultivars in the cucurbitaceae grown in Marmara region extensively. CMV isolates locally and systemically infected all inoculated varieties of cucumber, squash and melon. Only one CMV isolate (CM_2) infected Sugar Baby variety of watermelon systemically. All WMV-2 isolates systemically infected 14 inoculated varieties of cucurbits and they did not produce local lesion on inoculated leaves, contrast with CMV isolates.

INTRODUCTION

Cultivated cucurbits are important vegetable crops grown in Marmara Region. Viruses infecting these crops were recently isolated and identified as CMV and WMV-2 (16).

CMV has been reported to be transmitted to the seed of wild cucumber (**Echinocystis lobata**) (3, 4). This has been confirmed by LINDBERG et al. (9). Later, some researches have also reported that CMV is seed transmitted in some cucurbits (13, 19, 20. 21).

In this study, considering the importance of seeds as the source of viruses in the fields, transmissibilities of CMV and WMV-2 through cucurbit seeds were tested and determined their hosts in the Cucurbitaceae grown in Marmara region extensively.

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MATERIALS and METHODS

1. Assay of seed transmission for CMV and WMV-2 isolates

1.1. Production of seeds

The cucurbitaceous hosts listed in Table (1) were planted in the greenhouse, and their cotyledons were inoculated mechanically with CMV and WMV-2 isolates separately. After symptoms had developed, the seedlings were transplanted to big earthen pots and Institute field for seed production. The seeds from each plant were separately harvested 90 days after inoculation. Two methods were used to detect virus in the seed.

1.2. Seedling test

The seeds from each infected plant were referred as one sample. Representing 10 cultivars and 12 isolates, 50 seeds were selected at random from each of 65 samples. Then the seeds were sown in steamed soil and fertilizer mixture in boxes. The seeds were treated with 10 % trisodium phosphate for 1 hr before sowing to prevent surface contamination in the seed transmission assays (17). The resulting seedlings were regularly examined for symptoms of virus infection from the cotyledonary stage to one month old plants. At least 5 plants from each samples were assayed on **C. amaranticolor** (or **C. quinoa**), **N. tabacum** 'xanthi', **Cucurbita pepo** 'Sakız' (and/or) **Cucumis melo** by sap inoculation technique to check for latent transmission of virus (21).

1.3. Direct seed test

Studies were done with 27 samples representing 9 cultivars and 12 isolates. Twenty seeds from each sample were tested. The seeds were soaked in water overnight and the seed coats and integuments were removed. Single embryos were separately ground in a mortar with 10 volumes of 0.1 % - K_2SO_3 solution (17), and resulting suspension was used to inoculate carborandum-dusted leaves of **C. amaranticolor** (or **C. quinoa**), and sometimes additionally **N. tabacum** 'xanthi' and a cucurbit. The plants were observed 15-20 days after inoculation for symptom development.

2. Cultured cucurbit hosts of CMV and WMV-2 isolates

In this study, all isolates were assayed on 14 varieties in the Cucurbitaceae grown in Marmara region extensively (Table 3).

Infected leaves of **N. tabacum** 'xanthi' (with each CMV isolate) and **Cucurbita pepo** 'Sakız' (with each WMV-2 isolate) were ground in 0.05 M phosphate buffer pH 7 (g/ml) using a pestle and a mortar (11). Then the extracts were inoculated by finger on carborandum dusted cotyledons of the seedlings of each cucurbit cultivars with ten replications in a greenhouse. The plants were regularly observed after inoculation and appeared symptoms were recorded. Back inoculations were made from the plants not showing clearly visible symptoms to **Chenopodium amaranticolor**, **C. pepo** 'Sakız' and **C. melo**.

Isolates and cucurbit cultivars used in seed transmission tests were presented in Tables 1 and 2.

Table 1. Isolates and cucurbit cultivars used in seedling test

Isolates	Samples of host plants			
	Cucumber	Squash	Melon	Watermelon
CMV				
CC_1	Çengelköy (2)	Sakız (1)	Kırkağaç (2)	Sugar baby (1)
	Dere (1)			
CM_2	Çengelköy (1)	Sakız (1)	Kırkağaç (2)	Sugar baby (1)
			Hasanbey (1)	Washington (1)
CM_3	—	Sakız (2)	Kırkağaç (1)	—
		Kestane (1)		
CS_4	Çengelköy (2)	Sakız (1)	Kırkağaç (1)	Sugar baby (1)
	Dere (1)	Kestane (1)		
CS_5	—	Sakız (3)	—	Sugar baby (1)
		Kestane (1)		
WMV-2				
WM_6	Çengelköy (1)	Sakız (1)	Kırkağaç (2)	—
			Topatan (1)	
WM_7	—	Kestane (2)	Kırkağaç (2)	—
WS_8	Çengelköy (2)	Sakız (1)	—	—
WS_9	Çengelköy (1)	Sakız (1)	Kırkağaç (2)	Sugar baby (2)
	Dere (1)	Kestane (1)		Washington (1)
WS_{10}	—	Sakız (1)	—	Washington (2)
WW_{11}	—	—	Hasanbey (1)	Sugar baby (2)
				Washington (2)
WW_{12}	Çengelköy (1)	Sakız (1)	Kırkağaç (1)	Sugar baby (2)
			Pamukova (1)	

( ) = number of samples

Table 2. Isolates and cucurbit cultivars used in direct seed test

Isolates	Samples of host plants			
	Cucumber	Squash	Melon	Watermelon
CMV				
CC_1	Çengelköy	—	Hasanbey	—
CM_2	—	—	Kırkağaç Pamukova	Sugar baby Washington
CM_3	—	—	Topatan Pamukova	—
CS_4	Çengelköy	Sakız Kestane	—	—
CS_5	—	Sakız Kestane	—	Washington
WMV-2				
WM_6	Çengelköy	—	Kırkağaç	Sugar baby
WM_7	—	—	Hasanbey	Washington
WS_8	—	Sakız	—	—
WS_9	—	Sakız	—	—
WS_{10}	—	Kestane	—	Washington
WW_{11}	Çengelköy	—	—	Sugar baby
WW_{12}	—	—	Kırkağaç	Sugar baby

RESULTS and DISCUSSION

1. Seed transmission studies

Seed borne infection serves to initiate source of virus inoculum from which the virus can later spread quickly to the healthy plants. For this reason investigations were done to determine if our CMV and WMV-2 isolates are seed transmissible or not in cultivated cucurbits.

Seed and seedlings of cucumber, squash, melon and watermelon obtained from CMV and WMV-2 infected plants did not show evidence of viral infections. Most of the workers have also reported that CMV (5, 8, 12) and WMV-2 (1, 2, 5, 6, 15) is not seed transmitted in cucurbits, while others (3, 4, 9, 13, 19, 20, 21) have recorded positive results. According to TOMLINSON and CARTER (22) CMV was transmitted in the seed of infected **Stellaria media** plants. Many workers have determined that SMV (quash mosaic virus) is seed-transmitted in cucurbits but the mentioned virus was not isolated in our studies.

2. Cultured cucurbit hosts of CMV and WMV-2 isolates

Infected rates of cucurbit cultivars inoculated with CMV and WMV-2 isolates were presented in

Table 3.

In order to determine their cultured cucurbit hosts, all our isolates (16) were assayed on 14 cultivars of the cucurbitaceae grown in Marmara region extensively.

CMV isolates infected locally and systemically all the inoculated varieties of cucumber, squash and melon. Only one isolates (CM_2) of CMV systemically infected Sugar baby variety of watermelon and its infection rate was 20 %. Generally on watermelon systemic infection did not occur with CMV. However, some workers (5, 23, 24) have reported positive results. CM_2 isolate was found tobe virulent than the others. Necrosis were produced on the young leaves and the tips of melon and squash with it. The virus could cause wilt and dying-off in these plants as reported before (8, 10, 18).

Table 3. Systemic infection rates of various cucurbitaceous cultivars inoculated with CMV and WMV-2 isolates

	CMV isolates					WMV-2 isolates						
	CC_1	CM_2	CM_3	CS_4	CS_5	WM_6	WM_7	WS_8	WS_9	WS_{10}	WW_{11}	WW_{12}
Cucumis sativus												
«Çengelköy»	10/10+	10/10	10/10	10/10	9/9	8/10	6/10	10/10	10/10	6/10	6/9	7/10
«Dere»	10/10	10/10	10/10	10/10	9/10	7/10	7/10	7/10	9/10	5/10	6/9	4/10
Cucurbita pepo												
«Sakız»	10/10	9/9	10/10	9/9	10/10	9/9	10/10	10/10	10/10	8/10	9/10	10/10
C. maxima «Kestane»	10/10	10/10	9/9	8/8	10/10	10/10	10/10	9/10	10/10	10/10	10/10	9/10
Cucumis melo												
«Kırkağaç»	10/10	8/8	10/10	10/10	9/9	8/10	10/10	10/10	9/10	8/9	9/10	7/10
«Hasanbey»	10/10	10/10	9/9	10/10	9/9	9/10	8/10	9/9	10/10	9/9	7/10	9/10
«Pamukova»	10/10	10/10	10/10	9/9	10/10	8/10	7/10	8/10	10/10	7/9	6/10	8/10
«Topatan»	10/10	9/10	10/10	10/10	9/10	9/10	6/10	9/9	10/10	8/10	8/10	6/10
Citrullus vulgaris												
«Sugar baby»	0/10	2/10	0/10	0/10	0/10	10/10	10/10	9/10	9/10	10/10	5/10	10/10
«Washington»	0/10	0/10	0/10	0/10	0/10	10/10	10/10	7/10	10/10	8/9	9/10	8/10
«Charleston Gray»	0/10	0/10	0/10	0/10	0/10	8/10	9/10	8/10	7/10	10/10	8/10	9/10
«Yeni Dünya»	0/10	0/10	0/8	0/10	0/8	9/10	7/10	9/9	8/8	6/10	7/9	8/9
«Karabuz»	0/10	0/10	0/9	0/10	0/10	9/9	10/10	10/10	10/10	8/9	7/8	10/10
«Yuvarlak Alaca»	0/10	0/10	0/10	0/8	0/10	9/10	8/8	9/10	9/9	8/10	9/10	7/8

+ Number of plants systemically infected/Number of plants inoculated

All WMV-2 isolates systemically infected 14 inoculated varieties of cucurbits and they did not produce local lesions on inoculated leaves, contrast with CMV isolates.

CMV caused more severe stunting in cucumber, squash, melon than WMV-2 in this study. The obtained results agree with those determined before by some workers (7, 14).

ÖZET

MARMARA BÖLGESİNDE CUCURBITACEAE FAMİLYASI KÜLTÜR BİTKİLERİNDE GÖRÜLEN VİRUS HASTALIKLARININ TANILANMASI, TOHUMLA GEÇİŞ DURUMLARININ VE KONUKÇU DİZİLERİNİN SAPTANMASI ÜZERİNDE ARAŞTIRMALAR

2. Kabakgil kültür bitkilerinden isole edilen CMV ve WMV-2'nin tohumla taşınma durumları ve kabakgil konukçuları

Marmara bölgesi Kabakgil kültür bitkilerinden elde edilen CMV (Hıyar mozayik virusu) ve WMV-2 (Karpuz mozayik virusu-2) izolatları tohumdan gelişen fideler ve direkt tohumlarla yapılan test sonuçlarına göre denenen hıyar, kabak, kavun ve karpuz çeşitlerinde tohumla taşınmamaktadır.

Kabakgil kültür bitkilerindeki konukçularını saptamak amacıyla izolatlarımız Marmara bölgesinde en çok yetiştirilen 14 Kabakgil çeşidinde denendiler. CMV izolatları inokule edilen hıyar, kabak ve kavun çeşitlerini lokal ve sistemik olarak enfekte ettiler. Sadece bir CMV izolatı (CM_2) Sugar baby karpuz varyetesini sistemik olarak hastalandırdı. Tüm WMV-2 izolatları inokule edilen 14 Kabakgil varyetesini de CMV'nin aksine lokal lezyon oluşturmadan sistemik olarak enfekte ettiler.

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Distribution and Incidence of Tobacco Wildfire (**Pseudomonas syringae** pv. **tabaci** (Wolf and Foster) Stevens) in the Black Sea Region of Turkey in 1980 and 1981

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ABSTRACT

This study was carried out to determine the distribution and incidence of Tobacco Wildfire (**P. syringae** pv. **tabaci**) at seedling and field stages in Samsun, Tokat, Amasya, Trabzon and Sinop provinces in Black Sea Region of Turkey during 1980 and 1981. The incidence of the disease in these provinces was found to be, on average, ranging from 0.00 % to 8.39 % at seedling stage and from 0.00 % to 0.76 % at field stage.

INTRODUCTION

In Turkey, Tobacco Wildfire (**Pseudomonas syringae** pv. **tabaci** (Wolf and Foster) Stevens) was previously recorded in İzmir, Aydın, Balıkesir, İzmit and Samsun (Özkan and Ülgen, 1941), but later Karel (1958) and Karaca (1966) reported the occurrence of this disease in almost all the tobacco growing areas of Turkey. This study was carried out to determine the distribution and incidence of the disease in Black Sea Region of Turkey.

MATERIALS and METHODS

Survey of seedling stage was carried out at the time of transplanting. Each county was considered as a unit and 2 % of the total seedbed covering an area of 10 m² was considered as a unit where a 20 X 20 cm quadrate was thrown randomly and both healthy and diseased tobacco seedlings in this quadrate were counted separately. This was made by throwing the quadrate once per 10 m² for the part of seed-beds covering an area up to 100 m² and for the remaining part that larger than 100 m² once per 100 m² for up to 1000 m² and once per 500 m² for areas larger than 1000 m². No quadrate was thrown for the healthy seed-beds and they were considered as zero.

At field stage 0.5 % of the tobacco growing areas of the region was surveyed. Each 5 decar tobacco field was considered as a unit. In the fields in which the disease observed the counting was made by

walking diagonally and counting both diseased and healthy plants at each 10 th step.

The identifications have been made by Agricultural Faculty, University of Ankara.

RESULTS and DISCUSSION

As shown in Table 1 the incidence of the disease at seedling and field stages in the counties of Samsun was found to be 0.00 - 0.02 % and 0.00 - 0.76 % respectively, It was 0.04 - 0.23 % and 0 00 - 0.36 % for the counties of Tokat respectively, 0.00 - 0.17 % and 0.00 - 0.32 % for the counties of Amasya, 0.51 - 8.39 % and 0.00 - 0.02 % for the counties of Trabzon respectively and 0.00 - 0.08 and 0.00 - 0.45 % for the counties of Sinop respectively.

Although the climate of Black Sea Region is more favourable for the development of the disease than the other regions, the incidence of the disease was low in all the provinces other Trabzon, as shown in Table 1. The incidence of the disease at seedling stage was the highest in Trabzon with an average of 8.39 %. In this province the highest incidence of the disease as 32.68 % was recorded in Toklu village.

Since the disease rapidly developes under favourable conditions epidemic years in the future may be expected.

ÖZET

TÜRKİYENİN KARADENİZ BÖLGESİ TÜTÜNLERİNDE 1980 ve 1981 YILLARINDA VAHŞİ ATEŞ (Pseudomonas syringae pv. tabaci (Wolf and Foster) Stevens) HASTALIĞININ DAĞILİMİ VE YOĞUNLUĞU

Bu çalışma, Karadeniz Bölgesinde tütün üretimi yapılan illerde, Vahşi Ateş hastalığının 1980 ve 1981 yıllarındaki dağılımını ve yoğunluğunu ortaya çıkarmak amacıyla yapıldı.

Biri tütünün fidelik ve diğeri de tarla döneminde olmak üzere iki kez sayım yapıldı. Sayım sonucunda, ortalama olarak Samsun'daki fideliklerde % 0.00 - 0.02, tarlalarda % 0.00 - 0.76; Tokat'taki fideliklerde % 0.04 - 0.23, tarlalarda % 0.00-0.36; Amasya'daki fideliklerde % 0.00-0.17, tarlalarda % 0.00 - 0.32; Trabzon'daki fideliklerde % 0.51 - 8.39, tarlalarda % 0.00 - 0.08 ve Sinop'taki fideliklerde % 0.00 - 0.08, tarlalarda ise % 0.00 - 0.45 arasında değişme göstermiştir. Bölgede en yüksek yoğunluk % 32.68 ile Trabzon'un Toklu Köyündeki fideliklerde saptanmıştır.

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Table 1. The results of the survey of Tobacco Wildfire (**P. syringae pv. tabaci**) at seedling and field stages in Samsun, Tokat, Amasya Trabzon, and Sinop provinces in 1980 and 1981.

Province	County	Average incidence of the disease (%)	
		At seedling stage	At field stage
SAMSUN	Central	0.01	0.76
	Alaçam	0.01	0.50
	Bafra	0.02	0.34
	Çarşamba	0.01	0.76
	Havza	0.00	0.00
	Kavak	0.00	0.00
	Vezirköprü	0.00	0.00
TOKAT	Central	0.04	0.36
	Erbaa	0.11	0.06
	Niksar	0.23	0.00
AMASYA	Gümüşhacıköy	0.17	0.32
	Merzifon	0.00	0.00
	Taşova	0.02	0.00
TRABZON	Central	8.39	0.02
	Akçaabat	3.92	0.00
	Maçka	0.51	0.00
SİNOP	Central	0.08	0.45
	Erfelek	0.00	0.00
	Gerze	0.03	0.32

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Investigations on Soybean Seed-Borne Fungi And Their Rates of Presence

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ABSTRACT

This investigation was carried out to determine seed-borne fungi of soybean and their rates of existence.

Seed samples (Amsoy - 71, Williams, Woodworth) were taken from the store - houses of Tariş in Aydın, İzmir, Manisa and Aegean Regional Agriculture Research Institute. They were imported from U.S.A. At the end of the study, 46 fungi species belonging to 40 genera were isolated from the seeds.

INTRODUCTION

Soybean has been recently begun to grow in Turkey. For this reason there is a little research work on it (Ayaydın, 1973).

Seeds are of very importance for increasing the yield of the crops quantitatively and qualitatively in the field of agriculture. Seeds must be healthy to increase the agricultural production.

Microorganisms that invade and colonize soybean seeds before harvest can reduce the yield and quality of the seed crop. Infected seeds provide inoculum that may infect the new crop when they are sown. Pathogens may also be disseminated over long distances and introduced into new areas via infected seeds.

In literature, Sclerotium Blight (**Sclerotium rolfsii** Sacc.), Charcoal Rot **Macrophomina phaseolina** (Tossi) Gold.), Brown Stem Rot (**Cephalosporium gregatum** Allington and Chamberl), Pod and Stem Blight, Stem Canker (**Phomopsis sojae Leh.**), Anthracnose (**Glomerella glycines** (Hori) Lehman and Wlf), Brown Spot (**Septoria glycines** Hemmi), Leaf Spot and Blight (**Cercospora sojina** Hara, **Cercospora kikuchii** T. Matsu and Tomoyasu, **Alternaria tenuissima** Kunze ex Pers), Sclerotinia Stem Decay (**Sclerotinia sclerotiorum** (Lib.) de By., Mildew **Peronospora manshurica** (Naum Syd.), **Ascochyta sojaecola** Abram, **Chaetomium brassiliense**, **Cladosporium** sp., **Epicoccum purpurascens** Ehrenb. ex Schlect, **Helminthosporium** sp., **Paecilomyces** sp., **Pestolatia** sp., **Phoma** sp., **Phyllostic-**

ta sp., **Rhizoctonia leguminicola** and **Verticillium** sp. are recorded as seed -borne fungi that most of them cause important diseases on soybean (Sinclair and Dhingra 1975, Sinclair 1982).

The aim of this investigation is to determine seed-borne fungi on soybeans imported from U.S.A. and their rates of presence in 1983.

MATERIALS and METHODS

Seed samples of soybean originated in U.S.A. are taken from the store-houses of Tariş in Aydın (Williams, Woodworth), İzmir (Amsoy-71, Williams and Woodworth), Manisa (Amsoy-71, Williams and Woodworth) and Aegean Regional Research Institute, various laboratory means and necessities and chemical substances are the materials of this study.

Agar plate and blotter methods were used to determine seed-borne fungi. PDA medium was used for isolations. Eight hundred seeds were taken from each samples and 400 seeds of them were used for agar plate method and 400 seeds were used for blotter method.

In blotter method seeds were not sterilized, but in agar method, soybean seeds were sterilized with sodium hypochloride (1 %) then 10 seeds were placed in each petri dish. These were incubated at 20 ∓ 2°C under alternating cycles of 12 hours light 12 hours darkness. After 7 days incubation, every seed was examined under a stereomicroscope with 10 magnification in order to determine seed-borne fungi.

Fungi genera were identified according to Gilman (1959), Barnett (1960), Arx (1970), Domsch und Gams (1970), Ellis (1971), Sinclair (1982),

RESULTS and DISCUSSION

The fungi isolated and percentage of their presence from imported soybean seeds (Amyos-71, Williams, Woodworth) and from elite line (Woodworth) which Aegean Regional Agricultural Research Institute grew were shown in Table 1, 2, 3 and 4 respectively.

Table 1. The fungi isolated from Amsoy-71 soybean seeds and percentage of their presence (per 800 seeds)

Fungi	Blotter		Agar Medium	
	Number	Percentage of Presence	Number	Percentage of Presence
Actinomucor sp.	7	0,50	0	0
Alternaria spp.	117	8,28	20	4,05
Arthrinium sp.	17	1,20	4	0,81
Aspergillus spp.	118	8,35	14	2,83
A. flavus	2	0,14	2	0,41
A. niger	8	0,57	212	42,92
A. ochraceus	0	0	3	0,61
Botryotrichum sp.	2	0,14	0	0
Cephalosporium sp.	16	1,13	1	0,20
Cercospora sp.	0	0	1	0,20
Cladosporium spp.	563	39,84	50	10,12
Drechslera sp.	2	0,14	3	0,61
Fusarium spp.	28	1,98	6	1,22
Gliocladium spp.	8	0,57	0	0
Macrophomina sp.	0	0	1	0,20
Mucor spp.	46	3,26	0	0
Paecilomyces sp.	0	0	1	0,20
Papulospora spp.	0	0	1	0,20
Penicillium spp.	385	27,25	154	31,17
Peronospora sp.	1	0,07	0	0
Phoma sp.	4	0,28	1	0,20
Phomopsis sp.	0	0	1	0,20
Phyllosticta sp.	15	1,06	0	0
Rhizoctonia sp.	1	0,07	0	0
Rhizopus spp.	23	1,63	3	0,61
Stemphylium sp.	0	0	4	0,81
Trichoderma sp.	3	0,21	11	2,23
Trichotecium sp.	12	0,85	0	0
Ulocladium sp.	2	0,14	0	0
Steril	21	1,49	1	0,20
Unidentified	12	0,85	0	0
TOTAL	1413		494	

Table 2. The fungi isolated from Williams soybean seeds and percentage of their presence (per 1200 seeds).

Fungi	Blotter		Agar Medium	
	Number	Perecentage of Presence	Number	Percentage of Presence
Actinomucor sp.	1	0,05	0	0
Alternaria spp.	44	2,31	7	1,16
Arthrinium sp.	90	4,72	1	0,17
Ascochyta sp.	0	0	6	1,00
Aspergillus spp.	252	13,21	11	1,82
A. flavus	33	1,73	133	22,06
A. niger	20	1,05	49	8,13
A. ochraceus	1	0,05	0	0
Botryotrichum sp.	4	0,20	0	0
Botrytis sp.	13	0,68	0	0
Cephalosporium sp.	34	1,78	7	1,16
Chaetomium spp.	0	0	17	2,82
Cladosporium spp.	221	11,59	22	3,65
Drechslera sp.	2	0,10	5	0,83
Epicoccum sp.	2	0,10	14	2,32
Fusarium spp.	53	2,78	15	2,49
F. moniliforme	6	0,31	5	0,83
Gliocladium	5	0,26	0	0
Humicola sp.	1	0,05	1	0,17
Mucor spp.	16	0,84	0	0
Myrothecium sp.	0	0	1	0,17
Nigrospora sp.	0	0	2	0,33
Penicillium spp.	768	40,34	190	31,48
Pestalotia sp.	0	0	2	0,33
Phoma sp.	8	0,42	1	0,17
Phomompis sp.	10	0,52	37	6,14
Phyllosticta sp.	0	0	23	3,81
Pyrenochaeta sp.	0	0	16	2,65
Rhizopus spp.	238	12,48	0	0
Sclerotinia sclerotiorum	0	0	10	1,66
Trichoderma sp.	4	0,20	0	0
Trichotecium sp.	62	3,25	0	0
Ulocladium sp.	4	0,20	0	0
Steril	12	0,63	21	3,48
Unidentified	3	0,15	7	1,17
TOTAL	1907		603	

Table 3. The fungi isolated from Woodworth soybean seeds and percentage of their presence (per 1200 seeds).

Fungi	Blotter		Agar Medium	
	Number	Perecentage of Presence	Number	Percentage of Presence
Actinomucor sp.	3	0,17	0	0
Alternaria spp.	135	7,79	39	6,05
Arthrinium sp.	29	1,67	7	1,08
Aspergillus spp.	69	3,98	34	5,26
A. flavus	4	0,23	80	12,38
A. niger	30	1,73	33	5,10
A. ochraceus	0	0	4	0,62
A. sulphuracens	0	0	1	0,16
Botryotrichum sp.	0	0	1	0,16
Cephalosporium sp.	34	1,96	18	2,78
Chaetomium sp.	0	0	1	0,16
Cladosporium spp.	591	34,10	98	15,17
Drechslera sp.	1	0,06	0	0
Epicoccum sp.	1	0,06	16	2,48
Fusarium spp.	22	1,27	3	0,46
F. lateritium	0	0	1	0,16
Gliocladium spp.	5	0,29	0	0
Melanospora sp.	0	0	2	0,31
Mucor spp.	25	1,44	4	0,62
Myrothecium sp.	1	0,06	0	0
Paecilomyces sp.	0	0	1	0,16
Penicillium spp.	612	35,33	238	36,84
Periconia sp.	0	0	2	0,31
Phomopsis sp.	1	0,06	21	3,25
Phyllosticta sp.	1	0,06	0	0
Rhizoctonia sp.	0	0	2	0,31
Rhizopus spp.	114	6,58	5	0,77
Trichoderma sp.	1	0,06	0	0
Trichotecium sp.	7	0,40	0	0
Ulocladium sp.	10	0,57	0	0
Verticillium sp.	1	0,06	0	0
Steril	16	0,92	31	4,79
Unidentified	20	1,15	4	0,62
TOTAL	1733		646	

Table 4. The fungi isalated from Woodworth (elite) soybean seeds and percentage of their presence taken from Aegean Regional Research Institute (per 400 seeds.)

Fungi	Blotter		Agar Medium	
	Number	Perecentage of Presence	Number	Percentage of Presence
Actinomucor sp.	0	0	1	0,39
Alternaria spp.	41	7,14	24	9,27
Arthrinium sp.	2	0,35	0	0
Aspergillus spp.	4	0,70	2	0.77
A. flavus	0	0	3	1,16
A. niger	15	2,61	53	20,46
A. ochraceus	0	0	7	2,70
A. sulphuracens	0	0	1	0,39
Botryotrichum sp.	1	0,17	0	0
Cephalosporium sp.	1	0,17	0	0
Chaetomium sp.	0	0	1	0,39
Chloridium sp.	0	0	1	0,39
Cladosporium sp.	358	62,37	26	10,04
Drechslera sp.	1	0,17	0	0
Fusarium spp.	11	1,92	4	1,54
F. moniliforme	4	0,70	0	0
Gliocladium sp.	2	0,35	0	0
Mucor spp.	2	0,35	4	1,54
Myrothecium sp.	1	0,17	0	0
Penicillium spp.	81	14,11	99	38,22
P. patulum	0	0	1	0,39
Rhizopus spp.	43	7,50	32	12,35
Steril	2	0,35	0	0
Unidentified	5	0,87	0	0
TOTAL	574		259	

Imported Amsoy-71, Williams and Woodworth soybean seeds were grown as second crop in Aegean Region in 1983. Fortysix fungi species belonging to 40 genera were isolated from the soybean seeds as shown in table 1,2,3 and 4. These fungi, except **Arthrinium, Botryotrichum, Papulospora** and **Melanospora**, were also isolated from soybean seeds in the foreign countries (Sinclair and Dhingra 1975, Sinclair 1982).

Generally, **Penicillium** spp. were the most isoloted fungi from all samples tested in both agar and blotter tests, This genus was followed by **Cladosporium** spp., **Aspergillus** spp., **Rhizopus** sp., **Alternaria** spp., **Fusarium** spp., **Phomopsis** spp., **Trichotecium** sp., **Phyllosticta** sp., **Cephalosporium** sp., **Chaetomium** spp., **Mucor** sp. fungi and by **Actinomucor Botryotrichum, Botrytis, Gliocladium, Helminthosporium, Ulocladium, Trichoderma, Melanospora, Epicoccum, Humicola, Macrophomina, Myrothecium, Papulospora, Pyronechaeta, Phoma, Stemphylium, Rhizoctonia, Verticillium, Pestolatia, Sclerotinia, Cercospora, Ascochyta, Peronospora** and **Nigrospora** genera at low rates.

It is recorded that, of the isolated fungi, **Alternaria, Cercospora, Myrothecium, Periconia, Phoma, Pestolatia, Pyrenochaeta, Stemphylium** genera cause leaf blight on soybean and that **Cephalosporium** spp. lead to brown stem rot and **Botrytis** spp. are the cause of seed rot and seed blight and that **Peronospora** spp. lead to downy-mildew and **Phomopsis** spp. give rise to pod and stem blight, stem canker and that **Fusarium** spp. lead to blight or wilt, root rot and pod and collar rot and that **Macrophomina** spp. are the cause of charcoal rot and **Rhizoctonia** spp. give rise to root rot, stem decay and damping off (Ayaydın 1973, Sinclair and Dhingia 1975, Sinclair 1982),

It is found that, among the pathogen fungi, **P. glycines, P. phaseoli, P. sojae** species of **Phomomsis** genus cause disease on soybean according to some research done by other workers (Sinclair and Dhingra 1975, Sinclair 1982). It is come to the conclusion that species of **Phomopsis** isolated from imported soybean seeds may be new ones because these species are different from the ones isolated from the other hosts in our country (Göbelez 1964, Kaşkaloğlu et al 1975).

Downy mildew (**Peronospora** sp.) was found only on Amsoy-71 seeds we tested. In the years to come, this pathogen is likely to be a threat to soybean-growing because it causes an important disease on soybean in some countries by depending on the weather conditions.

Macrophomina sp. which gives rise to an important disease on soybean was also found on Amsoy-71 soybean seeds. This pathogen must be included in our seed certification list because of carrying by seed.

Besides these, **Sclerotium sclerotiorum** (Lib.) By., the control of which is very difficult, was also isolated from the soybean seeds.

Consequently, with the exception of these fungi, **Chrysodeixis (= Plusia) chalcites** Esp. (Lepidoptera: Noctuidae) was also found on certificated soybean seeds imported from U.S.A. This pest was also observed in many soybean growing fields at Menemen in 1983 by Industrial and Ornamental Plants Laboratory of Regional Plant Protection Research Institute at Bornova. For this reason it is absolutely necessary that it must be caid close attention to quarantine measures better than today with respect to seeds and growing materials to be imported.

Ö Z E T

SOYA TOHUMLARIYLA TAŞINAN FUNGUSLAR VE BULUNUŞ ORANLARININ SAPTANMASI ÜZERİNDE ARAŞTIRMALAR

Bu çalışma A.B.D. kaynaklı Amsoy-71, Williams, Woodworth ile Ege Bölge Zirai Araştırma Enstitüsünden temin edilen Woodworth (elit) soya tohumlarıyla taşınan funguslar ve bunların bulunuş oranlarını saptamak amacıyla yapılmıştır.

İzolasyon çalışmalarında nemli hücre ve agar yöntemleri kullanılmıştır.

Nemli hücre yönteminde tohumlar hiç bir muameleye tabi tutulmaksızın içinde steril kurutma kâğıdı bulunan 10 cm çapındaki petrilere 10'ar adet olarak yerleştirilmiştir.

Agar yönteminde ise tohumlar % 1 lik sodium hipokloritte 10 dakika müddetle bekletilip steril su ile yıkandıktan ve steril kurutma kâğıdı ile kurutulduktan sonra Penisilin ve Streptomisin sülfat ilâve edilmiş PDA içeren 10 cm. çaplı petrilere 10'ar adet olarak ekilmiştir.

Petriler 1 hafta müddetle 20 ∓ 2°C de 12 saat karanlık ve 12 saat aydınlıkta tutulmuşlardır. Bir haftalık inkubasyondan sonra petri kabındaki tohumlar üzerinde gelişen funguslar mikroskopta incelenmiş ve tanısı yapılan funguslar teker teker kaydedilmişlerdir.

Çalışma sonunda 40 fungus genusuna bağlı 46 tür saptanmıştır.

Üzerinde çalışma yaptığımız tüm örneklerde genellikle hem nemli hücrede, hem agarda **Penicillium** spp., **Cladosporium** spp., **Aspergillus** spp. gibi saprofit karakterli fungusların yanısıra, soya'da yaprak lekesi (**Alternaria, Cercospora, Myrothecium, Periconia, Phoma, Pestolatia, Pyrenochaeta, Stemphylium**), kahverengi gövde çürüklüğü (**Cephalosporium** spp.) tohum çürüklüğü ve fide yanıklığı (**Botrytis** spp.), kök, kök boğazı ve bakla çürüklüğü, yanıklık ve solgunluk (**Fusarium** spp.), siyah çürüklük (**Macrophomina** spp.), gövde çürüklüğü (**Sclerotinia sclerotiorum** (Lib.) By.), bakla ve gövde yanıklığı, gövde kanseri (**Phomopsis** spp.), kök ve gövde çürüklüğü (**Rhizoctonia** sp.) ve mildiyö'ye (**Rhizoctonia sp.**) neden olan etmenlerde bulunmuştur.

Peronospora sp.

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Sensitivity Levels To Metalaxyl In Six **Plasmopara helianthi** Novot. Isolates

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ABSTRACT

In this study, some differences were found in the sensitivity of the isolates to metalaxyl concentrations. For example, two isolates out of six, were inhibited by the concentrations of 21,0 and 28,0 µ g metalaxyl/100 g. seeds, one isolate could not be eliminated at the 70 µ g metalaxyl/100 g. seeds. The sensivity of the isolates were not changed after continuous transferrings to the increasing concentrations of metalaxyl.

INTRODUCTION

The north and north-west of Turkey are the most important sunflower growing areas of the country. According to the statistics of 1981 the total sunflower growing area was 500.000 hectars and the yield amounted to 575.000 tons (1). **Plasmopara helianthi** Novot., the causal agent of the downy mildew disease, is one of the main pathological problems of this economically important plant and can cause heavy losses every year (25, 35). For controlling this very destructive sunflower disease, metalaxyl (Aprin 35 DS) is being used in Turkey for seed dressing since the beginning of 1983. According to the reports, of different authors (2, 3, 7, 9, 10, 12, 15, 22, 27, 28), Peronosporales can become resistant to acylalanine fungicides. Therefore, the purpose of this study is to find out the present sensitivity levels to metalaxyl in six **P. helianthi** isolates, obtained from the different sunflower growing areas of Turkey, and to determine the relation between the treatments of the isolates with subletthal concentrations of the chemical and their sensitivity levels.

MATERIALS and METHODS

In the experiments metalaxyl (Aprin 35 SD, 35 % metalaxyl, Ciba-Gegy AG) was used as seed dressing. Tested **P. helianthi** isolates were obtained from the soils of Ege (No. 1, 4 and 5) and Black-Sea Re-

gion (No. 2, 3 and 7) of Turkey. For isolating the pathogen from the soils sunflower seeds were sown to the different soil samples, put in to the pots, and the zoosporangia from the isolates were obtained from the cotyledons of the infected seedlings as trap. Seeds of the sunflower cultivar «VNIIMK 8931» were treated with different concentrations of the fungicide. After treatment, the seeds were germinated for three days (21) and then dipped in the zoosporangial inoculum containing 150.000 zoosporangia/ml (16).

The experiments were conducted in controlled chambers at 22 ∓ 2°C in pots, according to the randomizing plot design with five replications. Ten seeds were sown in every pot (replication). For the evalutions, 10 or 12 days after inoculation, the plants were covered with polyethylen bags, and two days later the intensity of sporulation on the cotyledons was assessed visually according to the numerical scale from 0 (no infection) to 4 (100 % infection) (5).

Four isolates were transferred to increasing concentrations of metalaxyl to obtain changes in their sensitivity levels (20).

RESULTS

Results of the tests on the sensitivity levels to metalaxyl in six **P. helianthi** isolates were given in the Table 1.

Table 1. Sensitivity levels to metalaxyl in **P. helianthi** isolates

No. of Isolate	Infection Severity, as Percent of Control, in Metalaxyl Concentrations μ g. a i /100 g. seeds)									
	7	14	21	28	35	42	49	56	63	70
1	3,25	2,26	0,97	0,00	0,00	0,00	0,00	0,00	0,00	0,00
2	0,00	16,13	12,39	1,39	6,97	0,00	0,00	0,00	0,00	0,00
3	28,32	37,52	33,33	2,11	0,00	0,00	0,00	0,00	0,00	0,00
4	2,38	6,71	0,00	1,33	0,00	2,68	1,18	0,00	0,00	1,33
5	25,22	2,79	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
7	60,71	5,08	34,40	6,35	0,00	5,61	11,89	1,72	0,00	0,00

As seen in the Table 1, some differences were found in the sensitivity levels of the isolates to metalaxyl concentrations. For example, one isolate out of six were completely eliminated by the concentration 21 μg metalaxyl/100 g. seeds, one isolate could not be eliminated at 70 μg metalaxyl/100 g. seeds. On the other hand, some variabili-

ties were established in the infection severities in some isolates. These variabilities are more visible in the isolates No. 4 and 7 which are more insensitive to metalaxyl than the other isolates.

For obtaining the changes in the sensitivity levels of the pathogen with increasing concentrations continuously transfer in sensitivity to the toxicant was observed in the infection rates of the isolates. But, in the consequent transfers the sensitivity of the isolates to increasing concentrations of metalaxyl were not changed.

DISCUSSION

Systemic acylalanine compound metalaxyl is very effective to the members of Peronosporales (19, 29, 30, 31, 32, 34). Results of different trials show that the fungicide is also controls the sunflower downy mildew agent **P. helianthi** successfully (17, 21, 23, 33). Although the excellent results were obtained from acylalanine fungicides, these compounds which have high selection pressure classified in the high risk resistance category and resistance to acylalaines is not linked to decreased fitness (8, 12, 13, 14). According to DEKKER (11), in a sensitive fungal population to a particular fungicide less sensitive individuals may occur, and because of the selection pressure of the chemical these less sensitive indivuduals begin to spread. In this study six **P. helianthi** isolates were tested. In our tests, although metalaxyl concentrations were lower than the suggested rates in practise, especially one isolate (No. 4) is found less sensitive than the others. These findings have some similarities with the results from the field studies were done in the three regions of Turkey, (18, 24, 26). According to these trials performed in Ege Region (24) 140 g, 185 g and 210 g. metalaxyl to 100 kg seeds, and those in Marmara Region (18) 210 g metalaxyl to 100 kg seeds were found to be 100 % effective to **P. helianthi.** However in Black Sea Region (26) effectiveness of the chemical at 185 g and 210 g to 100 kg seeds were determined 66,6 % and 70,1 % respectively. On the other hand, secondary infections are also important in the spread of the pathogen (6). Moreover, the concentration of metalaxyl took up by the growing young plant counters a decline effect because of the increasing mass of the tissues, and so, during the secondary infections by the airborne propagules the pathogen can meet with the sublethal metalaxyl concentrations in the leaves. This may lead to occurrence of less sensitive strains of the pathogen in nature. For this reason, as stated by MELERO-VERA et al. (23), the risk of considered in the strategies of useing it for controling sunflower downy mildew.

No changes were found in the sensitivity levels of the pathogen treated with increasing metalaxyl concentrations. Metalaxyl resistant

isolates of Peronosporales members were obtained from the nature by different authors (2, 7, 8, 10, 22, 27, 28). But, the studies for changing the sensitivity levels of the isolates of different pathogens after applying the increasing rates of metalaxyl was not successed (2, 3, 4).

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ÖZET

ALTI Plasmopara helianthi Novot ISOLATININ METALAXYL'E DUYARLILIK DÜZEYLERİ

Saksı koşullarında ve kontrollu koşullarda yapılan çalışmada, Ege (1 ve 5 No'lu izolatlar) ile Karadeniz Bölgesi'nden (2, 3 ve 7 No'lu izolatlar) elde edilen ayçiçeği mildiyösü etmeni **Plasmopara helianthi**'ye ait 6 izolatın metalaxyl (Aprin 35 SD)'e duyarlılıkları araştırılmıştır. Yapılan testler sonucu izolatların duyarlılık düzeyleri arasında bazı farklılıkların bulunduğu ortaya konmuştur. Örneğin, 6 izolattan 2 tanesi 21,0 ve 28,0 µg metalaxyl/100 g tohum dozunda engellenebilirken, bir izolat 70 µg metalaxyl/100 g tohum dozunda bile elimine edilememiştir. Sürekli olarak yükselen dozlara yapılan transferler, izolatların metalaxyl'e duyarlılığını değiştirmemiştir.

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Preliminary Investigation of A Boll Rot Incidence of Cotton Damaged By **Pexicopia malvella** (Hb.) in Iğdır Plain

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ABSTRACT

According to the observations in cotton fields of Iğdır Plain about 1 % cotton boll rot incidence was recorded. A **Rhizopus** sp. which is penetrating and developing into cotton bolls through the wounds made by a newly idetified Lepidopterous pest **Pexicopia malvella** (Hb.) is responsible for this infection. Boll rot infection is usually occur during the rainy and humid conditions, but when rotten bolls lose their water content, they look like mummified in the same season. This is the first report from Iğdır Plain about the boll rot incidence in the cotton growing areas in Turkey.

INDRODUCTION

In many cotton growing areas of the world various fungi are recorded to be the causal agents of cotton boll rots. Some of these pathogens such as **Ascochyta gossypii** Woron., **Glomeralla gossypii** Edg., **Diplodia gossypii** Chi, **Fusarium** spp., **Phomopsis** sp., **Phytopthora capsici** Leonian, **Rhizoctonia solani** Koehn and a bacterial pathogen **Xanthomonas campestris** p.v. **malvacearum** (Smith) Dye. are primary agents while the members of **Alternaria, Cephalosporium, Chaetomium, Curvularia, Mucor, Pestolatia, Trichotecium** and **Rhizopus** are typical saprophytic agents of the cotton boll rots (Pinckard **et al.**, 1981). Despite of the presence of many reports from different countries, there was only one report of boll rot incidence from Turkey (Bremer ,1948). **Rhizopus** spp. as one of the saprophytic cotton boll rot agent was isolated from the cotton seeds in Ege Region (Karaca **et. al.**, 1973; Esentepe **et. al.**, 1977). On the other hand Esentepe (1974) isolated some species of this genus from the wilted cotton plants and soil samples taken from the cotton fields in Çukurova and Antalya Plains. During the survey study in Iğdır Plain in 1984 summer, mummified and completely rotten cotton bolls were encountered which were previously injured by a harmful Lepidopter pest. In

order to identify the causal agent of this brown rot infections of cotton bolls and to report its incidence, this preliminary study was conducted.

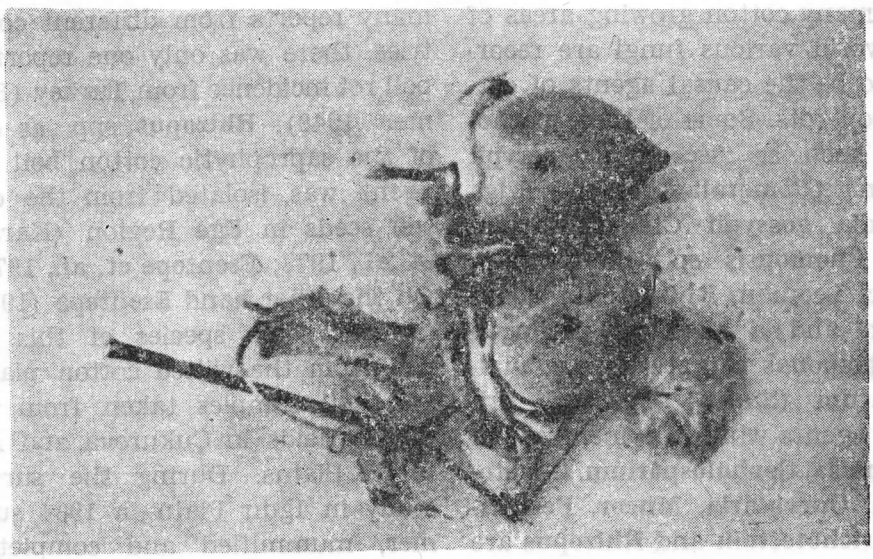
MATERIALS and METHODS

The infection rate of cotton boll rot incidence was evaluated by counting rotten bolls in three different fields in Iğdır Plain. The samples of rotten, mummified and healthy bolls in the size 2-3 cm in diameter were collected seperately during the field trip.

Five bolls from each sample were sterilized surfacely with 0.5 % sodiumhypochloride by immersing them into the solution for two minutes. They were rinsed in sterile distilled water and put into sterile polyethylen bags seperately. All of the bags were incubated at 20°C for 48 hours in an incubator. After this incubation period fructification organs of the causal agent of boll rot appeared. The microscobic slides were prepared from these fructification organs by using 0.5 % of cotton blue in lactophenol and they were examined under light microscope and some pictures were taken from these slides.

RESULTS and DISCUSSION

Average 1 % of rotten bolls were counted in the field conditions. These rotten bolls of cotton were apjpeared as brown in color and fleshy when they are rot. They always had a wound of Lepidopterous larvae (Fig 1) which was identified as **Pexicopia malvella** (Hb.)* at the



F.g. 1. Cotton bolls wounded by **Pexicopia malvella**

* Doğanlar, M. Iğdır Ovasında Yeni Bir Pamuk Zararlısı **Pexicopia malvella** (Hb.) (Lepidoptera; Gelechidae) ve parazitleri (In Press)

center of the rot. If the newly developed bolls get rot infection, then they are loosing their water content quickly and get mummified. The full grown bolls however, exhibit fleshy rot condition for a long time in the season. After the incubation of cotton boll samples, the bag containing healthy bolls never showed any rot infection. Both rotten and mummified samples however, were exhibited fungal fructification organs abundantly (Fig. 2).

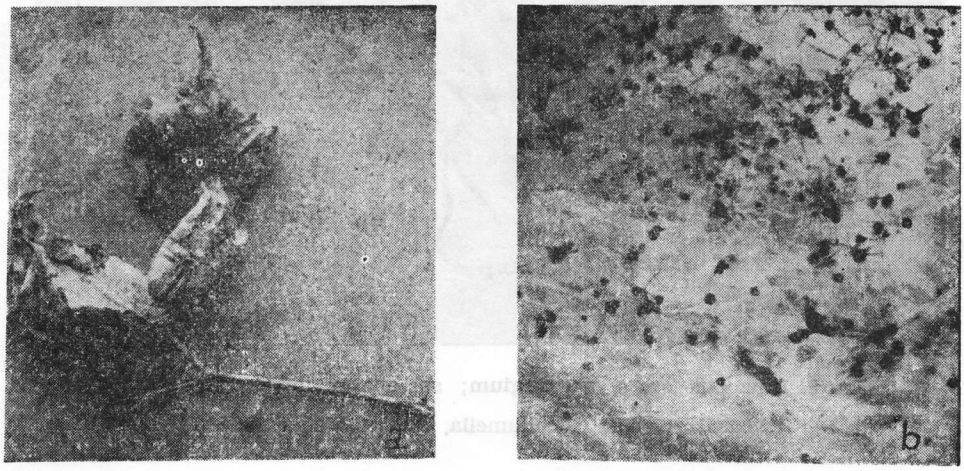


Fig. 2. Growth and fructification of **Rhizopus** sp. on (a) and inside the cotton bolls X 60 (b) under humid conditions.

The slides which were prepared from those organs of unknown fungus. showing rhizoids connected by aerial stolons, tufts of sporangiophores arised in groups from a clump of basal rhizoids and sporangia with collumella located terminally on the sporangiophores (Fig. 3). Comparision of all these described structures of the fungus with that of Alexopoulos (1962) and Webster (1970) revealed that, the saprophytic causal agent of cotton boll rot in Iğdır Plain is a species of **Rhizopus**.

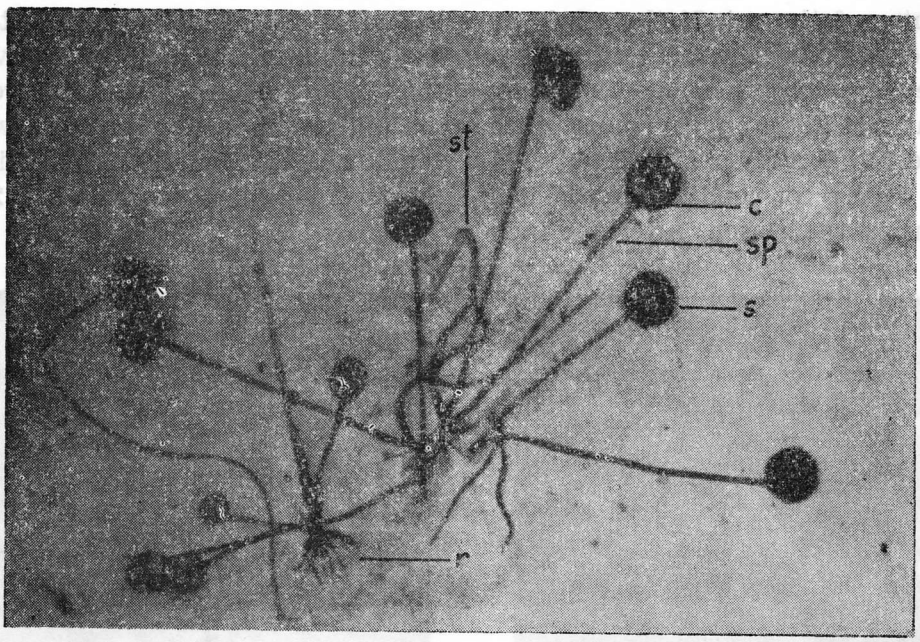


Fig. 3. Rhizopus sp. s, sporangium; sp, sporangiophore; st, stolon; r, basal rhizoid; c, collumella.

After the first report of boll rot infection caused by **Rhizopus nigricans** in some important cotton growing areas in Turkey by Bremer (1948) this disease has never been arttracted any attention. **Rhizopus** spp., however were isolated from the cotton seeds in Ege Region (Karaca **et. al.**, 1973 and Esentepe **et. al.**, 1977) and from the cotton plants in Adana and Antalya Provinces in Turkey (Esentepe, 1974). According to Pinckard **et al** (1981) the cotton boll rot infection caused by **Rhizopus** spp. requires a preexisting avenue of entry. Outbreaks of Lepidopterous insect pests can offer such an access. In this case the newly identified species **P. malvella** provides such accesses into the bolls of cotton plants which were densely populated in the fields of Iğdır Plain. The traditional hand-sowing type of cultivation of cotton seeds in Iğdır Plain, results in a higher number of cotton plants in a square of unit area in comparing with the planting seeds in rows by using machinery like in the other cotton growing areas in Turkey. That provides high humidity in the lower leaf canopy. So this prolonged periods of high humidity or free water on the surface of bolls is vital to the development of most boll rots. Probably that is the reason why **Rhizopus** boll rot occurs in Iğdır Plain and it is absent in the other cotton growing areas in Turkey.

The control methods of boll rot infection of cotton in Iğdır Plain

may include the effective control of **P. malvella** and changing of cultivation from hand-sowing to row-planting of seeds by using machinary.

ÖZET

IĞDIR OVASINDA **Pexicopia malvella** (Hb.)'NIN ZARARLANDIRDIĞI PAMUKLARDA GÖRÜLEN KOZA ÇÜRÜKLÜĞÜ HASTALIĞI ÜZERİNE ÖN ÇALIŞMALAR

Iğdır pamuk alanlarında yapılan gözlemlere göre yaklaşık % 1 oranında koza çürüklüğü belirlenmiştir. Bu duruma bölgede yeni belirlenen bir Lepidopter zararlısı **Pexicopia malvella** (Hb.)'nın açtığı yaralarda gelişen bir **Rhizopus** sp. türü neden olmaktadır. Özellikle yağışlı ve rutubetli ortam koşullarında kahverengi koza çürüklüğüne rastlanmakta, daha sonra bu çürük kozalar su kaybederek ayni mevsim içerisinde adeta mumyalaşmaktadır. Türkiye'de pamuk alanlarında böyle bir koza çürüklük olayı Iğdır Ovasında ilk defa saptanmış bulunmaktadır.

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New Record

A New Host for **Verticillium dahliae**: «Cosmos»

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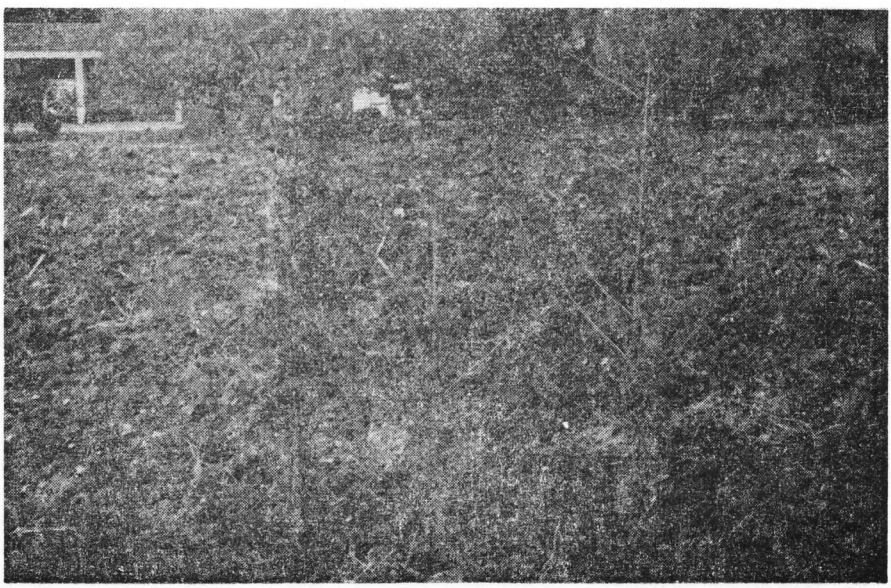
Up to now, Verticillium wilt has been found on many crops, ornamental plants and some weeds in Turkey (1, 2). These hosts are added a new one. **Cosmos sulphureus** L., grown in the garden of Regional Plant Protection Research Institute-Bornova, has shown typical wilt symptoms during September and October in 1984 (Picture, 1). It was seen that there was a discoloration in the vascular system of them. When the pieces from the wilted plants were placed on PDA and water agar, **V. dahliae** Kleb. grew purely on them.

Ö Z E T

«KOZMOZ» **Verticillium dahliae** İÇİN YENİ BİR KONUKÇU

Vertisilyum solgunluğu bugüne dek Türkiye'de pekçok kültür ve süs bitkisi ile bazı yabancı otlarda saptanmıştır (1, 2). Bornova Bölge Zirai Mücadele Araştırma Enstitüsü bahçesinde yetiştirilen **Cosmos sulphureus**'larda tipik solgunluk belirtileri (Resim, 1) Eylül-Ekim ay-



larında görülmüş ve hastalıklı bitkilerin iletim borularında renk değişikliği olduğu saptanmıştır. Su agarı ve PDA ortamlarında kültüre alınan hastalıklı gövde parçacıklarından **V. dahliae** Kleb. fungusu saf olarak gelişmiştir.

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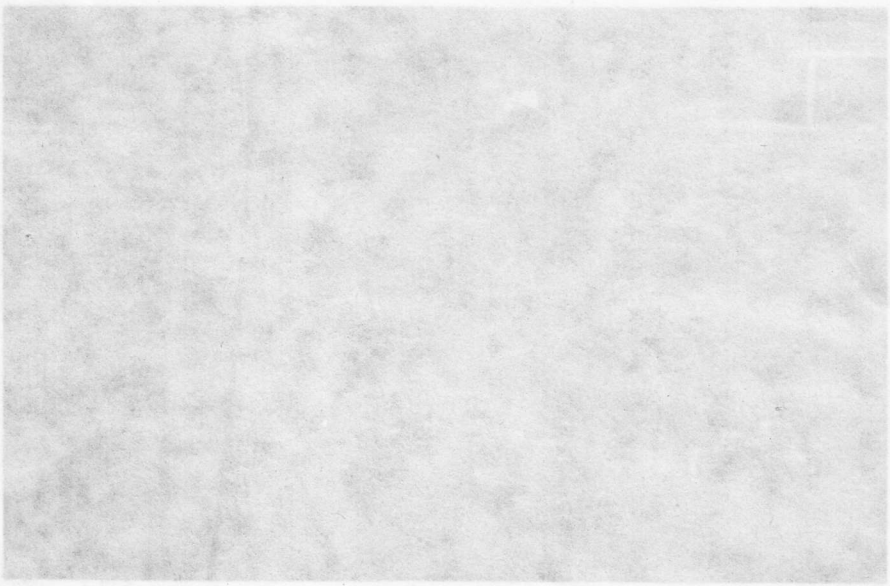

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