VOLUME : 6 NUMBER : 1 JON.: 1977

THE JOURNAL OF TURKISH

PHYTOPATHOLOGY

Published by the Turkish Phytopathological Society

The Journal of Turkish Phytopathology is published once every four months. Three parts form a volume. The subscription price of a volume (which includes postage) is $ 6.00

CONTETNS

J. Turkish Phytopath. Vol. 6, Num, 1, 1—7, 1977.

The Fungus Disease Stuation of Edible Legumes in Turkey *

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SUMMARY

Important Fungal diseases affecting edible legumes according to the genus are as follows.

Chickpeas : **Ascochyta rabiei, Ascochyta pinodella, Uromyces ciceris-arietini, Fusarium oxysporum, Fusarium acuminatum.**

Lentils : **Uromyces fabae**

Drybeans : **Colletotrichum lindemuthianum, Uromyces appendiculatus Sclerotinia sclerotiorum, Macrophomina phaseoli, Sclerotium rolfsii, Rhizoctonia solani, Isariopsis griseola, Phytophthora phaseoli.**

Broadbeans : **Ascochyta fabae, Botrytis fabae, Ascochyta pinodella, Ascochyta pisi, Cercospora zonata, Uromyces fabae.**

Peas : **Ascochyta pinodella, Ascochyta pisi, Erysiphe pisi, Peronospora pisi, Uromyces fabae.**

*) Paper presented at the 5 th "Journées de Phy'iatrie et de Phytopharmacie Circum-mediterranéennes" at Rabat (Morocco), 15—20 May, 1977.

INTRODUCTION

In recent years legumes have gained importance in human nutrition since they contain 20 % protein. Lately in Turkey, the annual legume area increased to 606.000 ha and the production reached 665.000 tons (1). Approximately 70 % of this area and production is edible legumes .

More chickpeas are sown and produced than other edible legumes. These are followed by lentils, drybeans, broadbeans, peas and kidneybeans (Table 1).

Table 1. Edible legumes Area sown, production and yield in 1974 in Turkey.

Crops	Area sown 1000's hect.	Production 1000's tons	Yield kg/ha
Chick-peas	175	195	1114
Lentils	117	120	1026
Drybeans	100	145	1450
Brood-beans	34	54	1588
Peas	3	3.5	1167
Kidney beans	2	1.8	900
Total	431	519.3	

From Table 1 it can be seen that although the area sown is relatively large, the production is not as high as expected. The most important reason of low yield is plant diseases .

Although legumes have been cultivated in Türkey from very early times, neither their diseases nor the efect of diseases on economic value have been studied extensively. In recent times this subject has been receiving increased attention under certain projects.

Important fungal diseases effecting edible legumes are summarized in this paper according to the genus.

RESULTS AND DISCUSSION

Chickpeas **(Cicer arietinum** L.)

The diseases of this genus have been studied more extensively than others. In Turkey, diseases are the most important factor limiting the production (14). The most common disease is anthracnose caused by **Ascochyta rabiei** (pass) Lab. It occurs in all areas every year and most destructive in moist springs. The pathogen is spread by seed. When contaminated seeds germinate and emerge first symptoms are produced in the lower internodes of young seedlings. Although most of them die, some can live. The pycniospores developed on the surface of these plants are dispersed by rain and wind. Then brown spots are observed on the above ground parts. If favorable conditions like warm, wet weather continue plants die soon.

The second important disease is root rot. In all areas it has been observed newly emerged seedlings were withered. When these were examined, it was observed that a part of stem just below the soil or the roots decayed completely. In later phases of the disease some wilted plants were seen in the field.

In order to find out the pathogens of root rot, infected fields were examined, soil and plant samples were taken. The plants grown in 30 soil samples and the ones taken from infested fields were tested (Table 2). Of the fungi isolated .

Table 2: Rate of participation of root rot pathogens from 56 plants which showed diseases under greenhouse conditions 62 % were **Pythium** 18 % were **Fusarium** and 20 % others. On the other hand, among those

Table 2 : Rate of participation of root rot pathogens

Number of Plant (or particle) examined	Fungi					
	Pythium		**Fusarium**		Other Fungus	
	Numb	%	Numb	%	Numb	%
56 (56)	35	62	10	18	11	20
50 (250)	34	14	169	68	47	18

isolated from 50 diseased plants taken from fields 14 % were **Pythium,** 68 % were **Fusarium** and 18 % others

Pathogenicity tests were applied to these isolates. As a result, pathogenicity of **Pythium** isolates were found to be 7-100 % while the pathogenicity of **Fusarium** isolates were 0-50 % (Table 3).

Mycological tests of these pathogen isolated showed that the isolates of **Pythium** were **Pythium ultimum** and the ones of **Fusarium** were **Fusarium oxysporum** and **Fusarium acuminatum.**

The third disease, chickpea rust, caused by **Uromyces ciceris-arietini** was seen only around Eskişehir during the survey years. Bremer et. al. (4,6) reported that although the disease occurs around Antakya and Ankara, it is mostly distributed in Southern part of Turkey and causes 70 % damage in some fields.

Lentils **(Lens esculenta)**

Lentils have been cultivated from very early times in Turkey especially in dryland areas but little is known about their diseases. Bremer et. al. (4,7) reported that **Uromyces fabae** is causing little damage in İzmir, Ankara, Tunceli and Hatay since it occurs at later stages of growth.

It is also reported that some **Fusarium** species cause wilting but those species were not identified (13).

Drybeans **(Phaseolus vulgaris)**

Drybean diseases are emphasized recently. For this purpose a collaborative project is being carired out by the University of Göttingen and the University of Ankara. In addlition a Ph. D study on this subject has been completed. These two projects indicated that the following diseases are widespread in Turkey and that their importance is changing from region to region.

Colletotrichum lindemuthianum

This disease was found in Turkey by Bremer et. al. (3) in Manisa, İstanbul, Bilecik and Çankırı. It was reported by Göbelez (10) that the disease also occurs in Eskişehir, Kon-

Table 3 : Pathogenicity of Isolate

Fungi	Number of Isolate examined	Percent Pathogenicity Min.	Max
Pythium	10	7	100
Fusarium	20	0	50

yan and Bolu. His study indicated that 8-17 % of the seed was contaminated and the total damage was around 10 %. According to Karaca (12), the disease is widespread in all parts of Turkey and is especially destructive in the Eastern part of the Black Sea Coast.

Our surveys made in 1976 also showed that the disease is very destructive in all regions, particularly in coastal areas. The races of pathogen and the reactions of Turkish drybean varieties are being researched.

Uromyces appendiculatus

Drybean rust is one of the widely distributed diseases however its damage is not serious since it occurs at later stages of growth. In recent years it was found by Bremer et. al. (4) in İzmir and Ankara.

Root **Rot**

In our surveys 1-5 % disease occurance was observed in drybean areas. Studies on pathogens have not been completed yet. However, **Macrophomina phaseoli** (8,13), **Rhizoctonia solani, Sclerotium rolfsii** (15), **Sclerotinia sclerotiorum** (3) were isolated from the plants showing root rot symptoms.

Another disease, angular leaf spot caused by **Isariopsis griseola** is prevalent along the Black Sea Coast. This disease also was found in Bilecik, Adana and Ankara by Bremer et. al. (5) and in Murgul by Karaca (13).

Phyllosticta phaseolina (13) and **Phytophthora phaseoli** (15) also occur in Turkey but were found unimportant.

Broadbeans **(Vicia faba)**

Broadbeans are commonly grown for feed in Europe but for in Turkey. They are well adapted to the coastal regions of Turkey with the Agean coast being the leading region.

Ascochyta fabae, a very destructive disease, is widely distributed all over the Agean coast (2). The pathogen was found by Bremer et. al. (5). Göbelez (10) reported that the disease is also widespread in the Southern part of Turkey.

Rust is another important disease that appears at the end of growing season. The pathogen **Uromyces fabae** was found in Ankara, İzmir, Balıkesir and Hatay by Bremer et. al. (4,7). According to Karaca (11) it also occurs in coastal regions.

The diseases caused by **Ascochyta pinodella, Ascochyta pisi, Botrytis fabae** and **Cercospora zonata** were reported by Bremer et. al. (5).

Peas **(Pisum sativum)**

Peas are grown only to a limited extent in Turkey and there is little information about their diseases.

Bremer et. al. (5) reported that **Ascochyta pinodella** and **Ascochyta pisi** are widely distributed in coastal areas.

According to Karaca (11) **Peronospora pisi** occurs in coastal areas and destructive particularly in moist years. Fortunately, it is not widely spread .

Uromyces fabae is another disease seen in Ankara (7). **Erysiphe pisi** found in İzmir but is not common in other parts of Turkey (3).

Kidney-beans occupy a limited area in Mediterranean and Agean Coastal Region and used as a food legume. We have no information about the diseases of this crop.

ÖZET

TÜRKİYE'DE YEMEKLİK BAKLAGİLLERDE GÖRÜLEN FUNGAL HASTALIKLARIN DURUMU

Türkiye'de şimdiye kadar Yemeklik Baklagillerde görülen Fungal Has talık etmenleri bitkilere göre şu şekildedir.

Nohut : **Ascochyta rabiei, Ascochyta pinodella, Uromyces ciceris-arietini, Fusarium oxysporum Fusarium acuminatum,**

Mercimek: **Uromyces fabae,**

Fasulya : **Colletotrichum lindemuthianum, Uromyces appendiculatus, Sclerotinia sclerotiorum, Macrophomina phaseoli, Sclerotium rolfsii, Rhizoctonia solani, Isariopsis griseola Phytophthora phaseoli,**

Bakla: **Ascochyta fabae, Botrytis fabae, Ascochyta pinodella, Ascochyta pisi, Cercospora zonata, Uromyces fabae,**

Bezelye : **Ascochyta pinodella, Ascochyta pisi, Erysiphe pisi, Peronospora pisi, Uromyces fabae.**

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J. Turkish Phytopath. Vol. 6, Num, 1, 9—14, 1977.

Investigations on the Determination and Control of the Important Weeds in Corn Fields in the Black Sea of Turkey

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ABSTRACT

This study has been carried-out during 1972-1974 to determine the important weeds found in corn fields in the Black Sea Region and their control possibilities. The important weeds in corn fields in the Black Sea Region were **Convolvulus arvensis** L., **Echinochloa crus-galli** (L.) Beauv., **Amaranthus retroflexus** L., **Chenopodium album** L., **Cirsium arvense** Scop., **Setaria verticillata** (L.) Beauv., **Digitaria paspaloides** Duby., **Sorghum halepense** (L.) Pers., **Xanthium macrocarpum** L., **Cyperus rotondus** L., **Cyperus longus** L., **Digitaria sanguinalis** (L.) Scop., **Mercurialis annua** L., **Aristolochia clematitis** L., **Artemisia vulgaris** L., **Solanum nigrum** L., **Cynodon dactylon** (L.) Pers., **Sinapis arvensis** L., **Sonchus** spp., **Amaranthus viridis** L., **Veronica** spp. and other species.

Different herbicides were tested against weeds in corn fields as pre-sowing, pre-and post-emergence, and their mechanical control possibilities determined.

INTRODUCTION

Corn is of considerable economic importance in Turkey ,especially in the Black Sea Region. Besides many diseases and pests, the weeds are also found in corn fields causing considerable crop losses.

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Behrens (1967) repored that the weed species found in corn fields are **Amaranthus retroflexus, Chenopodium album, Setaria** spp., **Echinochloa crus-galli, Sorghum halepense, Agropyron repens, Convolvulus arvensis** and **Cirsium arvense.**

The following weed species found in corn fields in Ukraine and their proportions are reported by Vorobev (1971), **Sinapis arvensis** (27 %), **Convolvulus arvensis** (19 %), **Setaria viridis** (10 %), and **Chenopodium album** (9 %). Gesthout (1971) noted that the weeds that reproduce at the highest rate are **Lactuca tatarica** (5400 seeds), **Cirsium arvense** (4700 seeds) and **Sonchus** spp. (1900 seeds).

In the chemical control of weeds in corn fields, herbicides are applied as pre-sowing, pre-and post-emergence (Behrens, 1967; Fink, 1968; Anonymus, 1969; Laborde et al., 1971 c; Anonymus, 1972 a.b). Miller(1970) noted that atrazine at the dosage of 325 gr per decar controlled the leaves. Yakolev(1969) reported that atrazine at 4 kg per hectar provided for control of weeds. Hammerton (1972) found that atrazine and cyanazine as pre-emergence provide a good weed control in corn fields.

Post-emergence application is advisable in the control of weeds on corn, which cannot be controlled by pre-sowing and pre-emergence applications(Behrens, 1967). 2,4-D amin and MCPA based herbicides applied post-emergence provided an easy and economic weed control (Laborde et al., 1971 c). Although ametryn at 1-5 kg per hectar as post-emergence provides control of broad-leaf weeds it gives excellent control of grasses (Anonymus, 1967; Laborde et al., 1971 c; Anonymus, 1971; Laborde, 1972). Paraquat at the dosage of 0.5 - 1 kg per hectar gave excellent control of weeds in corn fields (Anonymus, 1972 a). According to Laborde et al. (1971 c), the herbicides used in corn fields may be injurious to the crop and crop rotation and may stimulate the growth of undesirable weeds.

This study has been carried-out during 1972 - 1974 to determine the important weed species found in corn fields in the Black Sea Region and their control possibilities.

MATERIALS AND METHODS

This study was carried-out in the Black Sea Region during 1972-1974. Diker hybrid corn variety was used in the experiments that have been carried-out on clay loam soil low in organic matter (about 2 %). The tested products and dosage rates are given in table 1.

Table 1. The tested products and dosage rates

Name of the product	Firm of the product	Active ingredient (%)	Formulation	Dosage active/decar	Prep./decar
Gesatop 50	Geigy	Simazin 50	WP	175 gr	350 gr
				350 gr	700 gr
				500 gr	1000 gr
Gesaprim 50	Geigy	Atrazin 50	WP	175 gr	350 gr
				350 gr	700 gr
				500 gr	1000 gr
Bladex 50	Shell	Cyanazin 50	WP	100 gr	200 gr
				150 gr	300 gr
				200 gr	400 gr
Lasso EC	Monsantro	Alachlor 48	Em.	150 cc	312.5 cc
				250 cc	520.0 cc
				350 cc	729.0 cc
Aralon	Hoechst	Linuron 50	WP.	75 gr	150 gr
				100 gr	200 gr
				125 gr	250 gr
Weedkiller D	Shell	2,4-D Amin 50	em.	100 cc	200 cc
				125 cc	250 cc
				150 cc	300 cc
Gesapax 50	Geigy	Ametryn 50	WP.	100 gr	200 gr
				200 gr	400 gr
				300 gr	600 gr
Herban-m	Hercules	Norea 18.6 MSMA 28.6	em.	166.4 cc	400 cc
				208.0 cc	500 cc
				249.0 cc	600 cc
Gramoxon	Geigy	Paraquat 20	em.	30 cc	150 cc
				50 cc	250 cc
				80 cc	400 cc
Elmasil	Bayer	% 30 Trichloro acetio acid Na salt — % 30 3-amino-1,2,4-triazol % 10 2,4-D Sodium salt	WP.	280 gr	400 gr
				350 gr	500 gr
				420 gr	600 gr

The survey of the weeds was carried-out in 1973, in Samsun, Ordu, Giresun and Trabzon provinces where corn is grown largely to determine the important weed species and their densities in the region. In the survey of weeds, the countings were made in 330 corn fields that have been determined, based on the method described by Bora and Karaca (1970).

In mechanical control experiments the randomized block design with three replications and four characters (interrow cultivation, hoeing, interrow cultivation combined whith hoeing and check) was used. The size of each plot was 10 square meter.

The chemical control experiments were set up according to the randomized block design with three replications. The products to be tested were applied pre-sowing, pre-emergence and post-emergence using experimental plots that measure 5x5 m (25 m^2).

Simazine and atrazine at the dosages given in Table 1 were applied as pre-sowing one week before the planting. Simazine, atrazine, alachlor and linuron at the dosages given in Table 1 were applied as pre-emergence three days after the planting. Norea + MSMA, gramaxon, ametryn 2,4-D Amin and elmasil applied as post-emergence when the corn plants were the height of at 40-50 cm, grasses at 15-20 cm broad-leaf weeds at 3 to 5-leaf stage respectively.

RESULTS AND DISCUSSION

According to the results of survey of weeds, which has been carried-out in 1973, the weed species found in the corn growing areas in Samsun, Ordu, Giresun and Trabzon provinces and their proportions are a follows.

Weed species	Proportions (%)
Convolvulus arvensis L.	11.41
Echinochloa crus-galli (L.) Beauv.	9.24
Amaranthus retroflexus L.	9.12
Chenopodium album L.	8.98
Cirsium arvense Scop.	7.41
Setaria verticillata (L.) Beauv.	7.40
Digitaria paspaloides Duby	5.20
Sorghum halepense (L.) Pers.	5.13
Xanthium macrocarpum L.	4.95

Weed species	Proportions (%)
Cyperus rotundus L.	3.72
Cyperus longus L.	2.98
Digitaria Sanguinalis (L.) Scop.	2.81
Mercurialis annua L.	2.76
Aristolochia clematitis L.	2.10
Artemisia vulgaris L.	1.96
Solanum nigrum L.	1.84
Cynodon dactylon (L.) Pers.	1.74
Sinapis arvensis L.	1.54
Sonchus spp.	1.30
Amaranthus viridis L.	0.88
Polygonum convolvulus L.	0.88
Abutilon theophorastii Medick	0.70
Veronica spp.	0.61
Polygonum spp.	0.56
The other weed species	

The results of the studies showed that interrow cultivation of corn with tractor-mounted row cultivator failed to provide a good control measure of the weeds. Hoeing and interrow cultivation combined with hoeing proved to be an effective control against wedds when they were carried-out three times.

Although atrazine applied at three dosage levels (175-350-500 gr per decar) as pre-sowing and pre-emergence proved to be an effective against **Amaranthus retroflexus, Chenopodium album, Solanum nigrum, Sinapis arvensis, Equinochloa crusgalli** and **Setaria verticillata;** it gave an excellent control that resulted in the highest yield at 500 gr. par decar.

Cyanazin and alachlor applied pre-emergence at three dosage levels gave effective control of grasses while they failed to control the broad -leaf weeds. However, alachlor at the dosage of 350 gr. per decar gave effective control for **Amaranthus retroflexus, Chenopodium album** and **Solanum nigrum.** Linuron provided effective control of both broad-leaf weeds and grasses. Veselovskii et al. (1969), reported that no phytotoxicity has been observed in the linuron - treated beans, when planted between the rows of corn plants. It appears that the linuron application is advisable for corn in mixed cropping with bean in the Black Sea Region. Beside this, linuron has an advantage that it produces no phytotoxicity on the rotation crops which is planted after corn.

Among herbicides applied post-emergence Norea + MSMA, ametryn 2,4-D Amin and elmasil, controlled the broad-leaf weeds **(Sinapis arvensis, Xanthium macrocarpum, Cirsium arvense, Convolvulus arvensis)** effectively. They were proved to be an effective against grasses except 2,4-D Amin. It is interesting that although 2,4-D Amin is a selective herbicide for grasses, it controlled **Convolvulus arvensis, Cirsium arvense,** that cannot be controlled by pre-emergence application as well as many other broad-leaf weed species, effectively.

ÖZET

KARADENİZ BÖLGESİNDE MISIR TARLALARINDA GÖRÜLEN ÖNEMLİ YABANCIOTLAR VE SAVAŞLARI ÜZERİNDE ARAŞTIRMALAR

Bu çalışma 1972 - 1974 yıllarında Karadeniz Bölgesi mısır tarlalarında görülen önemli yabancıotları ve bunlarla mücadele olanaklarını saptamak amacıyla yapılmıştır. Karadeniz Bölgesinde mısır tarlalarında görülen önemli yabancıotlar **Convolvulus arvensis** L., **Echinochloa crus-galli** (L.) Beauv., **Amaranthus retroflexus** L., **Chenopodium album** L., **Cirsium arvense** Scop., **Setaria verticillata** (L.) Beauv. **Digitaria paspaloides** Duby., **Sorghum halepense** (L.) Pers., **Xanthium macrocarpum** L., **Cyperus rotundus** L., **Cyperus longus** L., **Digitaria sanguinalis** (L.) Scop., **Mercurialis annua** L., **Aristolochia clematitis** L., **Artemisia vulgaris** L., **Solanum nigrum** L., **Cynodon dactylon** (L.) Pers., **Sinapis arvensis** L., **Sonchus** spp., **Amaranthus viridis** L., **Veronica** sp. ve az oranda bulunan çeşitli yabancıotlardı.

Mısır tarlalarındaki yabancıotlarla savaş, mekânik mücadele, ekim-öncesi, çıkış-öncesi ve çıkış sonrası ilaçlı savaş şeklinde yürütülmüştür. Mekânik mücadele, el çapası, ara çapa + el çapası ve ara çapası yöntemlerinden en iyi sonuç el çapasından alınmıştır. Ekim-öncesi ve Çıkış-öncesi kullanılan simazin ve atrazin'nin her üç dozu da (350-700-1000 gr/da prep.) geniş yapraklı yabancıotlara etkili olmuş, dar yapraklı yabancıotlara ise 350-700 gr/da dozlar etkili olmamış; 1000 gr/da etkili olmuştur. Ekim-öncesi kullanılan cyanazin'in 400 gr/da (prep.) ve alachlor'un 729 cc/da (prep.) dozu geniş yapraklı yahancıotlara etkili olmuş, fakat dar yapraklı yabancıotlara etkili olmamıştır. Çıkış-sonrası kullanılan Norea + MSMA, paraquat, ametryn ve 2,4-D Amin kullanılmış ve iyi sonuç alınmıştır.

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J. Turkish Phytopath. Vol. 6, Num. 1, 17—23, 1977.

In Vitro and in Vivo Investigations on the Effect of Some Antagonistic Fungi Against the Damping - Off Disease of Eggplant

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ABSTRACT

A. niger, M verrucaria and **T. viride** isolated from the soil were tested against the damping-off pathogens, **F. solani, A. alternata** and **R. solani** in respect to their antagonistic action. As a result of **in vitro** tests **A. niger** showed the highest effect than the others. It was confirmed by the findings obtained from the **in vivo** test on eggplant seedlings.

INTRODUCTION

Damping-off disease of some vegetable crops such as pepper eggplant and tomato is an important problem for the seedling stage of these plants. Although there are some effective chemical control measures against the disease, the seed-beds are not treated by the producers, regularily. On the other hand, some soil chemical has a large spectrum in action, it destroys the microbial activity of both pathogenic and antagonistic groups so, a serious problem of a new contamination may arise. For this reason, in order to establish a useful balance between pathogenic and antagonistic microorganisms against the disease or to weaken pathogenic groups instead of using the chemicals with large spectrum should be consiclered (BAKER, COOK, 1974). It is known, that the antagonistic interaction between **Rhizoctonia solani** and **Trichoderma lignorum (T. viride)** since the year of 1932 (WEINDLING, 1932; ALLEN, HAENSELER,

1934). The antagonistic effect of **Myrothecium** sp. against **R. solani** has also been reported for the rhizosphere of pepper plant (FERGUSON, 1957). According to the results of an isolation study, conducted in 182 seed-beds (56 eggplant, 54 tomato and 72 pepper), Rhizoctonia was in association with each of the antagonists Trichoderma, Myrothecium and Aspergillus, in the percentages of 21, 2 and 23 respectively. The frequency for Fusarium was 27%, 3% and 42% and 10%, 0.5% and 14% for fungus Alternaria (TURHAN, 1973).

Present paper includes the results of the investigation on the antagonistic effects of **Trichoderma viride,** Pers., **Myrothecium verrucaria** (All. et Schw.) Ditm. ex Fr., and **Aspergillus niger** van Tieghem, on the development of **Rhizoctonia solani** Kühn., **Fusarium solani** (Mart.) Appel et Wollern, and **Alternaria alternata** (Fr.) Keissl.

MATERIALS AND METHODS

Antagonists: Three fungi, **T. viride, M. versucaria** and **A. niger,** were tested in respect to their antagonistic action against the damping-off disease. All the three were isolated from the soil of cotton field.

Pathogens : Three Pathogens of damping-off disease were included in the experiments : **R. solani, F. solani** and **A. alternata.** Two isolates of **R. solani** (R_1=from eggplant, R_2=from pepper) were used. **F. solani** isolated from eggplant and **A. alternata** from tomato seedlings.

Test Plant: In pot experiment for testing the antagonists, **in vivo**, the eggplant cultivar of Halkapınar was used.

In Vitro Tests: The three antagonistic and four pathogenic fungi were plated in petri dishes containing PD A medium. In orted to test the antagonistic action against each pathogen one pathogen and one antagonist were plated in each petri dish. Each treatment was replicated ten times and for each pathogen ten petri dishes were used as control. The planted dishes were then incubated at 25°C for ten days. Then, diameter of the colony growth of pathogens and antagonists was measured in milli meters.

In vivo Tests: The posts were filled with sterilized garden soil for growing the eggplant. The seven days old mixed culture of **R. solani** 1, **R. solani** 2, **F. solani** and **A. Alternata** were used as inoculum before seeding the eggplant. In to each pot, 40 ml of the inoculum mixture was added. One week later, besides the control pots, the soil in all the pots, was inoculated with the antagonists. One group of pots was inoculated with **T.**

viride while other with **M. vercucaria,** one group with **A. niger** and last one group with the combination of the three antagonists (M+T+A). Each treatment was replicated 5 times. Seven days after this treatment 50 eggplant seeds were sown in to each pot. The number of the healthy seedlings were determined in twenty days after sowing.

RESULTS AND DISCUSSION

In vitro Experiments: The colony diameter of antagonistic and pathogenic fungi was measured in the culture of ten days. The results are shown in Table 1.

Table 1. Colony growth of antagonistic and pathogenic fungi in the cultures of ten days.

Colony diameter of the pathogenic fungi			Colony diameter of the antagonistic fungi	
Species		Colony diameter (mm)	Species	Colony diameter (mm)
R. solani	(1)	40*	M. verrucaria	34
» »	(1)	40	T. viride	90**
» »	(1)	25	A. niger	30
» »	(1)control	90	—	—
R. solani	(2)	47	M. verrucaria	34
» »	(2)	40	T. viride	90**
» »	(2)	34	A. niger	32
» »	(2)control	90	—	—
F. solani		46	M. verrucaria	37
» »		32	T. viride	47
» »		45	A. niger	27
» »	(control)	57	—	—
A. alternata		45	M. verrucaria	40
» »		40	T. viride	90**
» »		37	A. niger	42
» »	(control)	74	—	—

*) All the figures represent the average measurement of 10 petri dishes.

**) Antagonist covered whole the surface including the colony growth of Pathogen in petri dishes.

From the above table it is clear that **A. niger** had more antagonistic effect as compared to all the three pathogens. It was followed by **T. viride** and **M. verrucaria** in respect to their antagonistic ability.

It is clear from Table 2, that **A. niger** showed the highest inhibition percentage of antagonistic effect on the three pathogens with the exception of **F. solani.**

Table 2. Percentage inhibition of the colonies of damping-off pathogens by some Antagonists (%)

Species of Pathogens	Species of Antagonists		
	M. verrucaria	T. viride	A. niger
R. solani 1	55,55	55,55	72,22
R. solani 2	47,77	55,55	62,22
F. solani	19,29	43,85	21,05
A. alternata	39,18	45,94	50,00

On the other hand, **T. viride** has a more constant effect on all the three pathogens than **M. verrucaria** and **A. niger.**

In respect to their nature of interaction only in case of **T. viride,** there was a direct contact between the antagonists and the pathogens with the exception of **F. solani** while in case of the other two antagonists, the nature of interaction was found to be antibiosis. Because, in all the cases, there was a clear inhibition zone between the pathogens and the antagonists (Figure 1,2,3,4).

In vivo Experiments: The number of healthy eggplant seedlings were recorded at the end of the seedling stage (Table 2).

W hile the numberf of healthy seedlings in control pots were averagely 6,8, in case of the combination of antagonists it reached to 23,8. In other word in the case of combination of the antagonists, healthy seedlings could be produced of three fold in the number of the control pots. **A. niger** showed the highest inhibitive effect on the disease.

But the differences among the three antagonists in respect to their inhibitive effect are not remarkable (Figure 5).

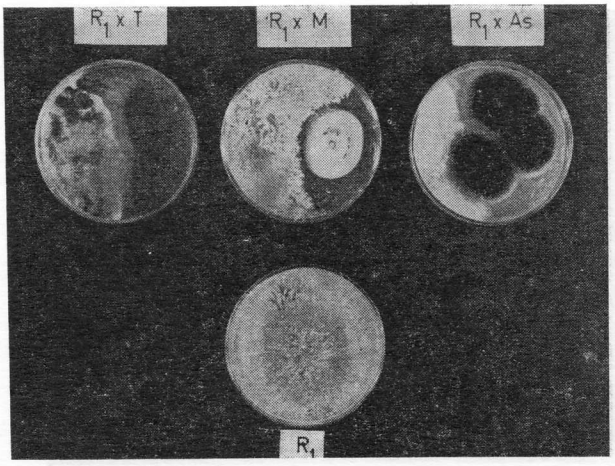

Figure 1. Antagonistic effect of T. viride (T), M. verrucaria (M), and A. niger (As) on R. solani 1 (R_1).

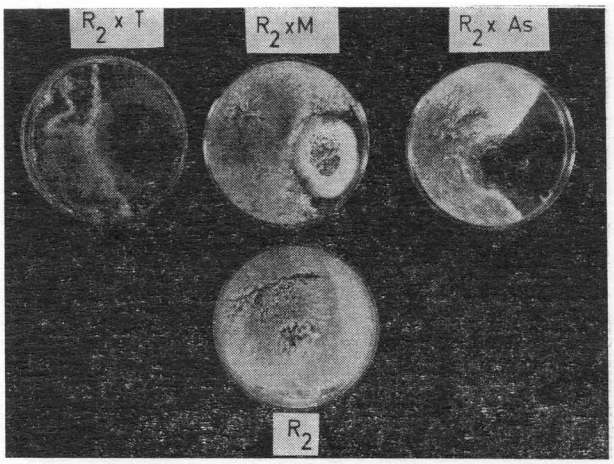

Figure 2. Antagonistic effect of T. viride (T), M. verrucaria (M), and A. niger (As) on R. solani 2 (R_2).

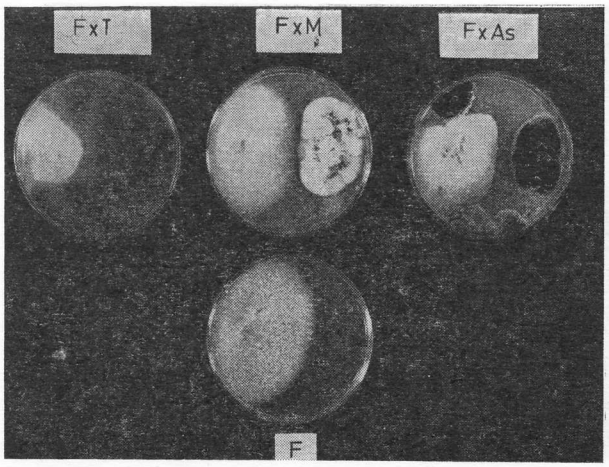

Figure 3. Antagonistic effect of T. viride (T), M. verrucaria (M), and A. niger (As) on F. solani (F).

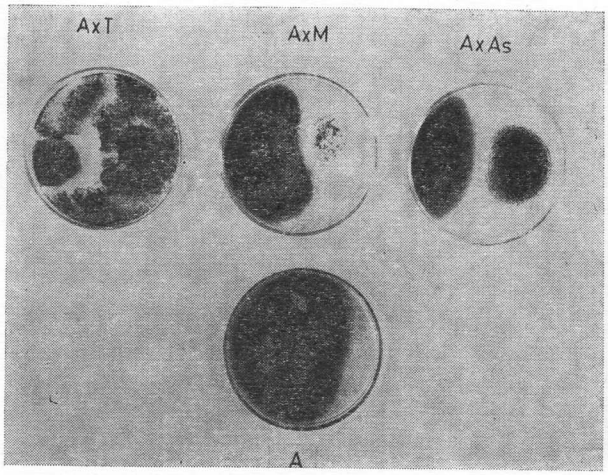

Figure 4. Antagonistic effect of T. viride (T), M. verrucaria (M), and A. niger (As) on A. Alternata (A).

Table 2. The number of healthy eggplant seedling escaped from damping-off disease in the pots treated with the antagonistic fungi*

	Treatment				
Replication	A.niger	T.viride	M.verrucaria	Comb. of the Antagonists**	Control
1	14	11	12	24	1
2	13	22	14	20	8
3	16	23	24	28	6
4	37	22	12	25	9
5	21	12	36	22	10
Total	101	90	98	119	34
Average	20.5	18	19.6	23.8	6.8

*) 50 Seeds were sown in each pot.

**) The pots were inoculated with the combination of the three antagonists.

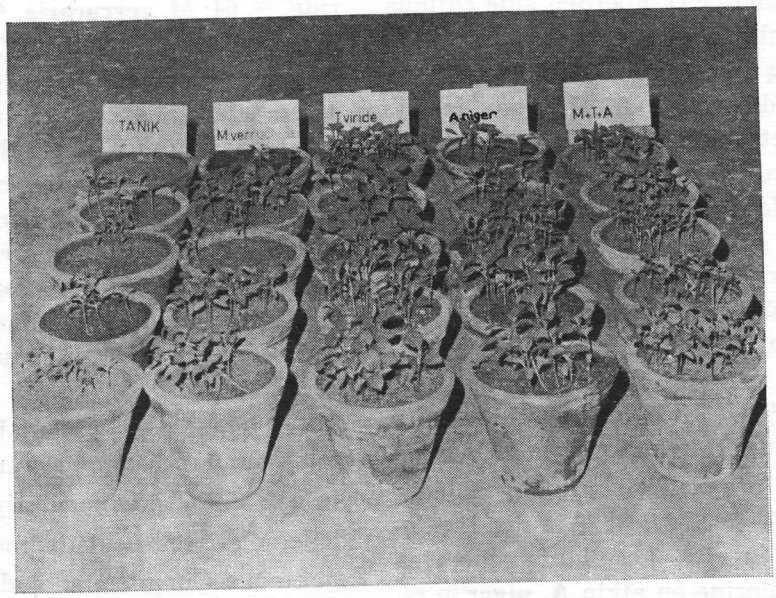

Figure 5. Effect of the three antagonists and their combination on the damping-off disease of eggplant

Only in the case of **A. niger**, it could be obtained in some what degre correlative effect from the tests of **in vitro** and **in vivo.**

It is the first attempt to test the some antagonists against the damping-off disease of eggplant in Turkey. According to the results, application of the antagonists, seems to be promisingly in controlling the disease. Now the results of pot experiments should be confirmied by the field trials before advising it as a control measure in practice .

ÖZET

BAZI ANTAGONİST FUNGUSLARIN PATLICAN ÇÖKERTEN HASTALIĞINA ETKİLERİ ÜZERİNDE IN VITRO VE IN VIVO ARAŞTIRMALAR

Pamuk tarlası toprağında elde edilmiş üç fungus, **A. niger, T. viride** ve **M. verrucaria** antagonist etkileri yönünden sebze fideliklerinde çökerten hastalığı etmeni olan üç patojene karşı önce **in vitro** olarak denendi. Bu patojenler **R. solani**'nin biri patlıcandan diğeri biberden elde edilmiş iki izolatı ile yine patlıcandan elde edilmiş bir **F. solani** ve domatesten elde edilmiş bir **A. alternata** izolatı idi. Petri kablarında yapılan 10 tekrarlı çalışmada **A .niger**'in patojenlerin koloni gelişimini geriletme oranı yüzde olarak sırasıyla şöyle bulunmuştur: **R. solani** 1: % 72,22; **R. solani** 2: % 62,22; **F. solani:** % 21.05 **A. alternata:** % 50.00; **T. viride** için bu değerler, sırasıyla, % 55,55; % 55,55; % 43,85; % 45,94 **M. verrucaria** için ise patojenlerin koloni gelişimlerinde gerileme oranı, aynı sırayla, % 5,55; % 47,77; % 19,29; % 39,18 dir. Bu durumda **in vitro** koşullarda çökerten patojenlerine en etkin **A. niger**'in olduğu anlaşılmaktadır. **T. viride** ise patojen kolonilerine etkinlik yönünden çok seçici davranmamış görünmektedir. Halkapınar patlıcanı ile saksı da yapılan denemelerde ise patojen karışımlarını içeren saksılara antagonistlerin birer birer ve 3'lü kombinasyon ile uygulanması durumunda çökerten oranı ortalama şöyle bulunmuştur: **A. niger,** % 59,6; **T. viride,** % 64; **M. verrucaria,** % 60,8, üçlü kombinasyon, % 52,2; Tanık saksıların ortalaması, % 86,4. Görülüyor ki en yüksek etki üçlü antagonist kombinasyonunun uygulanmasıyla elde edilmiştir. Bu işlemle çökerten tanık saksılara oranla ortalama % 34,2 oranında azalmaktadır. Yine tek başına **A. niger**'in uygulanması da, in vitro test sonuçlarına koşut olarak diğerlerine oranla, iyi sonuç vermiştir .

Ülkemizde yeni olan bu tür biyolojik savaş denemelerinin hiç kuşku yok ki, tarla denemeleriyle fidelik denemeleriyle pekiştirilmesi gerekmektedir. Önemli olan şudur ki, bir tek uygulama ile bile bu tür çalışmaların umut verici olduğu anlaşılmaktadır.

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J. Turkish Phytopath. Vol. 6, Num. 1, 25—46, 1977.

Determination of Virus Diseases on Cultural Plants in Turkey

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ABSTRACT

A broad Survey study was undertaken on economically important cultural plants in order to determine the presence of Plant viruses, with their distribution, host preference, infection rate, transmission and their possible control measures in Turkey. Results were obtained by macroscopical observations and they were outlined as a list shown in the text. Economicaly important cultural plants covering several fruit, industrial and vegetable plants were examined and the damage caused by plant viruses were found to be of considerable importance for certain regions of Turkey.

Eventhough the study enlightened many undetermined points, further specific investigations on plant viruses will be necessary in the future.

INTRODUCTION

The purpose of this study was to determine the kind of viruses present on cultural plants grown in our country and to estimate their infection rate, with their symptoms and also the possibilities of solving the virus problems in our country. With the help of this study it may be easier to concantrate to the important aspects of plant virology in the future.

The Cultural plants were taken as objects of this study and their virus diseases were determined from literature; their synonyms, geogrophicol distribution, economic importance, host range, symptoms, transmissions and control measures were diseased for Turkey.

The field survey were performed after review of literature subject and the study covered the Aegean, Central Anatolia, Marmara and Mediterranean Regions of Turkey.

MATERIALS AND METHODS

A. Central Anatolia, Mediterranean, Marmara and Aegean Region were divided into several parts according to the climatic and agricultural characteristics of the land, and the sampling areas were chosen randomyl depending on the coverage of the cultural plants in those areas.

Counts of diseased plants were made and percentage of the infection rate was calculated. Each orchard and vineyard was characterized by 25 samplings. There were at least 5 plants interval between each sampling plot. In the fields and vegetable growing areas diseased and healthy plants in 100 m^2 were counted, however in lettuce patches countings were done on 100 heads which were chosen randomly. Damage was not rated for all.

B. Identification of the virus diseases were done generally according to the symptoms given by Doolittle (1942), Köhler and Klinkowski (1954) Hubbeling (1955) Smith (1957), Klinkowski (1960), Canova et al. (1962) and Posnette (1963).

C. To determine the average infection rate for each region, the following formula was used;

$$\frac{\text{Total counts of diseased Plants in each sampling plot X 100}}{\text{Total counts of diseased plants + healty plants in each sampling plot}} = \text{Average infection rate}$$

D. Inquiries were prepared during this study and these were collected by written questionnaires or personel communications. To serve purpose the questionaires with the following information were included and these were given to the personnel who works in the related field at the Ministery of Agriculture.

1. Were there any determination of virus diseases earlier in the region.

2. If there were, which viruses and which plants were found infected!

3. Who identified the disease and when?

4. Which year the disease was severe and on which variety of the host phants?

5. How was the disease disseminated to the region (give the way of infection or transmission if it is known)?

RESULTS AND DISCUSSION

Diseases caused by plant viruses became the topics of many regional studies for a Longperiod of time in Turkey. Many researchers took part in determining the virus diseases macroscopically on several plant spe-

cies. Unfortunately the results of some of these studies were partially published.

High infection ability, wide host range, possibility of transmission by various ways, quick dissemination, and unsatisfactory chemical control characteristics of the plant viruses were made the problems more complicated and as the virus diseases disseminated in all over the country their importance is well accepted.

As it is pointed out in table 1, many valuable studies were done on citrus ,grape, potato, fig, pometious fruit trees and on some vegetable viruses during the recent years. The results of these studies showed that the virus diseases are widely spread in the country and they caused considerable yield Loss in Agriculture. Although these studies have given us many important data on some plant viruses, there are still many unknown points on their definite infection and damage rate, dissemination and control measures and these must be investigated.

Stubborn was the most common virus like disease on many citrus varieties in Turkey. This disease transmited by vegetative material and it doesn't show any symptom in early years of growth. Nuseller of Grapefruit Washington and Valancia which were imported from the U.S.A., were usually infected with the disease and there is almost no way to seperate the diseased plant from the healthy one before plantation. Among the foreign citrus varieties brought into the country there were almost none free from Stubborn infection.

Tristeza which was found very dangereous and was the cause of two million citrus trees death in the U.S. A., was not found to be very harmful in Turkey to date. However, Tristeza kills the trees as soon as the infection occurs, and also is should be kept in mind that there is always possibility of its infections in the country, because of its characteristic transmission by grafting, common usage of susceptible root stock to the disease ,and the possibility of enterance of its vector **(Toxoptera citricidus)** Kirk.) into the country. Therefore the protection against Tristeza is necessary earlier than its appearance in the orchard.

The diseases of Psorosis and Xyloporosis are transmitted vegetatively and they are widely spread in all over the citrus growing regions of Turkey. According to Cengiz (1968 a b) they cause 62 % yield loss on Clemantine mandarins. The chosen citrus rootstocks are usually resistant to these two virus diseases so that trees don't show clear symptoms of them and it is very difficult to seperate the diseased trees from the healthy ones.

Exocortis disease is transmitted vegetatively and also by means of grafting equipments (Özalp et al. 1968)[1]. Besides these, the virus is latent on the trees which their root-

stocks are Sour Oranges. This creates a problem in separation that which one of the trees should be acceptable for the establisment of a new orchard

Impietrature is the cause of extreem fruit fall on the trees and decreases the market value of the fruit considerably. It is one of the important topic that should be investigated

Signs and symptoms of some virus diseases were also determined on pome and stone fruit trees, but their causal agent are not known definitely. Pome and stone fruit breedings are the main income source for many regions. Therefore there is a desperate need to protect them from the virus diseases. The studies on these perennials concerning with viruses must be extended without any delay.

Degenerescence infectieuse (Vine Roncet virus) is the combination of a group of viruses found very common in all over the vineyard areas of our country. However the knowledge about the dissemination and the damage rate of the disease was not determined by survey. Therefore it is not possible to give a definite data about it. Hewitt[2] pointed out that the yield loss from this disease were reached up to 96 % and this necessiates a broad study on it as early as possible.

Transmission of Fig mosaic virus by means of vegetative materials and also a vector **(Aceria ficus** Cotte) created almost 100 % of infection on Figs.

As it is shown on table 1, virus diseases were determined on a very wide host plants covering vegetables legumes, potato and sugarbeets etc. Many of these diseases were transmitted by means of mechanical, vectors and some were transmitted by means of parasitic plants and seed. Therefore the infection rate reached up to 100 % in some areas depending on the way of transmission. However the rate of transmission affected by the ecological conditions, seed and vector relationships with the viruses and these should be investigated in detail. Potato leaf Roll virus disease can be a good example to this case when a Potato Leaf Roll infested field was sown with the same kind of seed for a few years without a rotation, the yield loss reached up to 90 % (Özalp 1964 b). Transmission of this disease by **Mysus Persica** Sulz. also increases the importance of the disease (Smith 1957).

The main protection method from plant viruses to date is to have a strict Quarantine regulations and inhibiting the enterence of diseased seed, root stock seedlings etc. to the

1) Özalp. O., T. Azeri., E. Heper 1968. Project No 105. 815. Annual Report. Regional Plant Protection Research Inst. Bornova, İzmir.

2) W.B. Hewitt 1967, Unpublished report, Viruses on vineyards in Aegean Region. Obtainable from Ministry of Food, Agriculture and Annimal Husbandry.

country by asking a quarantine certificate. These certified materials should be collected in a central laboratory, and examined carefully to be sure that they are free from the plant viruses, and then should be distributed to the farmers. The Menemen Agricultural Research and Introduction Center is the only organization where the task is undertaken in our country.

Clearing from viruses or breeding resistant varieties is accepted as a most important way of protection from the virus diseases and to be successful on this, it is necessary to work with a team of scientists combined by plant breeder, virologist, phytopathologist entomologist nematologist. It will be the most effective and recomendable way to diminish the dissemination and damage rate of the diseases.

Smith (1957) pointed out using resistant varieties against the Sugar Beet Curly top Virus Disease which were successfully controlled the disease, however it is not possible to control the disease with this method forever. It should be kept in mind that another race of the same virus may develop and renew the problem. These kind of studies must be done continiously.

One of the necessary point for protecting the plants from viruses is to avoid from their vectors. The virus and the vector relationships can be inhibited by choosing a proper time and condition of breeding. In the case of Potato breeding for seed production, choosing the high Land with Low temperature, and early sowing of sugar beet protects the plants from **Myzus persicae** Sulz. which transmits several plant viruses (Tanrısever 1959). Again, the most satisfactory method to run away from the Potato Stolbur disease is to make sowings before the appearance of **Hyalesthes obselatus** (Sign.) and breeding early varieties to avoid from the vector (Sahtiyancı 1968 a).

It is evident that, the plant viruses on various plants are common in almost every region of Turkey and the Studies on their identification infection and damage rate, must be continued and special attention should be given to the protection from these diseases. The Studies Should be conducted by a team of specialists from the field of Plant breeding, Virology, Entomology, Phy topathology and Nematology.

Table 1. The virus diseases found on the plant until 1969 in Turkey.

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
1. Stubborn (Little leaf) (viruslike disease)	**Citrus sinensis** L. Osbeck			
	Washington, oranges,	Adana and Mersin	up 29	(Cengiz 1965)
	Thompson, oranges,		75	(Cengiz 1965)
	Local orange varieties.		12	
	Washington	Adana	40.31*	
	C. paradisi Macf.	Mediterranean		
	Grapefruit varieties.	Region		
	C. reticulata Blanco			
	mandarin varieties			
	C. aurantium Linn.			
	Sour orange			
	C. grandis (Linn.)			
	Osbeck			
	Schaddock			
	Fortunella swingle	Antalya	4	(Cengiz 1965)
	Kumquat	Aegean Region	3	(Özalp and Azeri 1967)
		Adana and Mersin	few trees	(Cengiz et al. 1968)[3]
2. Tristeza (Quick decline)	Washington	Alanya		
	Yafa			
	Local			
	Gold nuget Navel			
	Kumquat			
	Rize mandarin	Mediterranean Region	few trees*	
		Aegean Region	one tree	(Özalp and Azeri 1967)

3. Psorosis Rimocortius Psorosis (Fawcett)	Orange varieties Finike Local Washington, Yafa, Kan, Sugar, Misket, Trablus, Pineaple, Moro, Gold nuget navel, Valancia and Mandarin varieties Satsuma, local, Klemantin Grapefruit	Mediterranean Region	99,98,96 92,74	(Cengiz 1968 b)
	Rize mandarins	Black sea Region		(Cengiz et al. 1968)
	mandarin varieties	Aegean Region	35	(Özalp and Azeri 1967)
	Rize mandarins Local mandarins Orange varieties			
4. Xyloporosis Cachexia dise ase, childs 1952	Mandarin varieties Klemantin	Hatay, Adana, Mersin	25—100	(Cengiz 1968 a)
	Local	»	20—90	
	Rize	»	8—53	
	Orange varieties Yafa, Trablus, Gold nuget navel Washington, Sugar Thompson, Kan Citrus varieties			

*) Determined with this study.

3) A. Cengiz, N. Tekinel, M.S. Dolar, H. Salih, Y.Z. Nas, 1968. Project No 103302. Annual Report. Regional Plant Protection Resparch Inst. Adana.

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
	sweet lime			
	Mandarine mandarin, Avana, Yusufi			
	Satsuma, Baladi			
	Mandarin varieties			
	Klemantin, Rize, local	Adana, Antakya	98* up, 28* up 92*	
	local	Aegean Region	23	(Özalp and Azeri 1967)
	Rize mandarins	Black Sea Region	1—6	(Cengiz et al. 1968)
	Yafa Oranges	»		
5. Exocortis Scaly Butt. Frazer and Levitt 1959	**C. lemon** L. Burnn lemon varieties (on **Trifoliate** rootstock)	Mediterranean Region	5 lemon trees	(Cengiz et al. 1968)[3]
	Orange varieties Washington.	»	13 trees	(Cengiz et al. 1968)
	Yafa, Moro, Interdonata Hamlin, Sanquinella, Magnum bonum, Valancia, Khallilly Yafa (on **P. trifoliate** rootstock)	Antalya		
	Rize mandarins	Aegean Region	90	(Özalp and Azeri 1967)
6. Impietratura	Yafa oranges	Mersin	6—81	(Cengiz 1968 c)
	Grapefruits	Mersin	12—98	»
	Sugar oranges	Dörtyol	35—92	»
	Klemantin mandarins	Alanya	few trees	»

	Oranga varieties Kan, Valancia, Washington, Thompson, Magnum bonum Grapefruit varieties Pink, Seedless, Duncan	Mediterranean Region		
	Oranga varieties Thompson, Washington Local, Sugar, Akçay Grapefruit	Mersin, Adana Dörtyol, İskenderun	ranges 4 to 80*	
	Orange and Grapefruit varieties	Aegean Region	1	(Özalp and Azeri 1967)
7. Sieve tube necrosis	Memeli lemons	Mediterranean Region	100	(Cengiz et al. 1968)[3]
	Memeli lemons	Mersin	100*	
	Memeli lemons and Oranga varieties	Aegean Region	18	(Özalp 1966, Özalp and Azeri 1967)
8. Apple mosaic virus **Pyrus Virus** 2(Bradford et Joky) Smith	**Pyrus malus** L.	Marmara Region		(K. Temiz)[4]
	Apple varieties	Central Anatolia		(Bremer 1954)
9. Apple Star crack	Apple varieties	Central Anatolia	not much	(Sahtiyancı 1964)[5]
10. Green crinckle	Apple varieties	Central Anatolia	not much	(Özkan and Kurçman 1968)[6]
11. Dapple apple	Amasya apple	Nevşehir, Kayseri, Malatya	few trees*	(Gömeç, 1966-1967)[7]

4) K. Temiz, Plant breeding Research Inst. Yalova.

5) S. Sahtiyancı. 1964. Project no 104809. Annual report. Regional Plant Protection Research Inst. Ankara.

6) M. Özkan and S. Kurçman 1968. Project No 104816. Annual Report-Regional Plant Protection Research Inst. Ankara.

7) B. Gömeç, 1966-1967. Unpublished Report. Agricultural Research and Introduction Center, Menemen-İzmir.

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
12. Rubbey wood	Starking apple	Bandırma		»
13. Russet ring	Apple varieties	Tekirdağ, Arifiye,		
14. Blister bark	Apple varieties	İznik		
15. Pimple wood	Starking	Sevral places		»
16. Amasya meyve çürüklüğü	Amasya apple	Marmara and Black sea Region		»
17. Proliferation	Golden delicious	Eğridir		»
18. Vein clearing	**Pyrus communis** L. pear variety	İstanbul Sapanca		(Gömeç 1966-1967[7]
19. Red mottle	»			
20. Stony pit	Akça variety	Nevşehir	few trees*	»
21. Quince mosaic	**Cydonia oblonga** Havan variety	İstanbul, Sapanca		»
22. Mosaic disease	**Prunus armeniaca** L. Apricot var. **P. Domestica** L. Plum var.			(Bremer 1954
23. Sharka	Kostencil plum	Edirne		(Sahtiyancı 1968 b)
24. Prune dworf	İtalyan plum	»		
25. Ring spot	**Prunus avium** L. (Sweet cherry var.) **Prunus cerasus** L. (sour cherry var.)	İstanbul, Tokat , Amasya		(Gömeç 1966-1967[7]
26. Rusty mottle	»	Bandırma, İstanbul Tokat, Amasya		
27. Rasp leaf	»	Amasya		(Alay et al. 1968)[8]
28. Amasya disease	»	İstanbul, Bandırma, Bursa, İzmir, Amasya		(Gömeç 1966-1967[7]
29. Rugara mosaic	»	Samsun		(Alay et al. 1968)[8]

8) K. Alay, N. Altınyay, Ö. Hancıoğlu, F. Dündar. 1968. Project No 108703. Annual Report. Regional Plant Protection Research Inst. Samsun.

30. Enation	»	Amasya		
31. Deep Sture	»	Amasya		
32. White crinckle	»	Bandırma and Manisa		(Gömeç 1966-1967[7]
33. Asteroidspot	**P. persica** L. peach var.	İstanbul		»
		İstanbul		»
34. Mules tail	»			
35. Stem pitting	»	Same places		»
36. Degenerescence infectieuse, Gallay Reisigkrankheit)	**Vitis vinifera** L. **V. vitifera** L. Vine varieties			
		Manisa	25.20*	
	Sultani, Seedless, Yuvarlak seedless, Yuvarlak sultani			
	Pink, Gamze, Razaki, Hurma	Manisa Bağcılık İstasyon	80*	
	Marabaşı	Marmara Region		(Akdoğan 1956, 1965)
	Vine varieties	Aegean Region		(Kepsutlu et al. 1962)
	Vine varieties	Aegean Region	83	(Vuittenez)[9]
	Vine varieties	Contral Anatolia	abaut	
	Vine varieties	Eskişehir, Kayseri	50*	
37. Fig mosaic virus Ficus virus 1, Condit and Horne, 1933	**Ficus carica** L. Fig varieties	it is found wherever the fig	100*	(Özalp and Azeri 1968)[10]
	Sarılop, Göklop Bardacık	plant is grown	100	

9) A. Vuittenez. 1962. Unpublished Report. Viruses on viyenards in Turkey. Obtainable from Ministry of Food, Agriculture and Animal Husbandry.

10) Ö. Özalp, T. Azeri. 1968. Project No 105817. Annual Report. Regional Plant Protection Research Inst. Bornova, İzmir.

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
38. Cucumber mosaic virus, Doolittle, 1920	**Lycopersicon esculentum** Tomato	Aegean, Mediterranean, Marmara, Central Anatolia Region, Samsun	not much*	(Göbelez 1953, Özkan 1957 Özalp 1964 a, Tekinel et al. 1969)
	Capsicum annum Pepper	İstanbul	up 100	(Özkan 1957)
		İstanbul	70—80	(İşmen 1962)
		Bursa, Bilecik, İnegöl, İznik Orhangazi		(Sahtiyancı et al 1967)[11]
		Aegean Region	very high	(Özalp 1963)
		Mediterranean	100	(Tekinel et al. 1969)
		Marmara, Aegean Mediterranean and central Anatolia Region	up 100*	
	Cucumis sativus Cucumber	İstanbul	31.64*	
		Mediterranean, Marmara, Aegean, Central Anatolian Region	up 90*	(İşmen 1962, Tekinel et al. 1969)
	Cucurbita maxima	İstanbul, Bursa, İzmir, Denizli, Uşak	it has been seen on several infected plants	(Özkan 1957) (İşmen 1962) (Özalp 1961)
	Cucumis melo L. Melon	İstanbul		(Özkan 1957)
	Apium graveolens Celery	İstanbul		(Özkan 1957)
	Spinacia oleracea Spinach	İstanbul		(Bremer 1954)
	Lilium			

11) Ş. Sahtiyancı, G. Varh, M. Battaloğlu. 1967. Project No 107814. Annual Report. Regional Plant Protection Research Inst. Erenköy, İstanbul.

	Zinnia			
	Petunia			
	Hippeastrum			
	Dephinium			
39. Cucumber green mottle mosaic virus, Ainsworth 1935 (Cucumis virus 2)	Melon	İzmir, Manisa	few plants*	(O. Özalp)
40. Tobacco Mosaic virus, Allard, 1914	Tomato	Aegean, Mediterranean and Marmara Region	occurs commonly	(Arı 1956, Özalp 1961, Tekinel et al. 1969) (Sahtiyancı et al. 1967)[11]
	»	İzmir	cpops	
	»	Adana and Mersin	55.55*	
			21.56*	
		Konya, Niğde, Ankara	10.70*	
		İstanbul, Bursa, İznik	46.99*	
	Solanum melongena	İzmir, İstanbul, Bursa	few plant*	(Özalp 1964 a)
	Egg plant	İzmir, Mediterranean Region	90	(Tekinel et al. 1969) (Sahtiyancı et al. 1967)[11]
	Pepper	Marmara Region		
		İstanbul, Bursa, Yalova	some plants*	
		Konya, Ankara, Kayseri, İzmir, Manisa, Düzce		
	Nicotiana tabacum	İt has been seen wherever the tabacco is grown		(Bremer 1948 a, 1954, Türkmenoğlu 1953, Özkan 1958, Özalp 1963, 1964 a)
	Tobacco	Aegean Region (Soma)	up 66*	
	Delphinium			(Bremer 1954)
	Petunia			
41. Single Virus Streak, Ainsworth, Berkeley and Coldwel, 1934	Tomato	Aegean Region		(Arı 1956, Özalp 1963)

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution % ratio	References
		Aegean, Marmara Mediterranean and Central Anatolia	some tomato plants*	
42. Tomato double virus streak, Smith 1957 (Tobacco mosaic virus+potato virus X)	»	İzmir		(Arı 1956, Özalp 1963)
43. Tomato bigbud virus, samuel, Bald and Eardley, 1933 (Viruslike disease)	Tomato	Ankara, Düzce Ankara, Afyon, Kayseri, Kırşehir İstanbul, Bursa, İznik	8.99* 52.99*	(Tanrıkut 1953)
44. Tobacco ringspot virus, Smith 1957	Eggplant **Solanum tuberosum** Potato Tobaco Dahlia	İzmir İzmir İzmir İzmir		 (Özalp 1964 a) (Özalp 1964 a)
45. Tobacco etch viruses, E.M. Johnson, 1930	Pepper	Mersin		(Tekinel et al. 1969).
46. Lettuce mosaic virus, Lactuca virus 1 (Jagger Smith	**Lactuca sativa** L. Lettuce	İzmir Mersin İzmir (Seferihisar)	 5—20	(Özalp 1963, 1964 a) (Tekinel et al. 1969).
47. Aster yellows virus, Smith 1957	Lettuce	İzmir	up 16*	(Özalp 1964 a)
	Petunia **Aster**	İzmir, Ankara		(Bremer 1954)

48. Lettuce necrosis virus, Kassanis	**Aster**			(Özalp 1964)
49. Tomato spotted wilt virus, Samuel, Bald and pitman	Lettuce	Mersin	5—10	(Tekinel et al. 1969).
	Hippeastrum			
	Lathyrus odaratus	Central Anatolia		
	Zinnia			
	Delphinium			
	Begonia	Central		(Bremer 1954)
50. Common bean mosaic virus, Pierce, 1934	**Phaseolus vulgaris**	Anatolia	up 90*	(Bremer 1948 a, Özkan 1958)
	bean	Mersin	3—20	(Tekinel et al. 1969).
51. Bean yellow mosaic virus, Smith 1957	bean	Mersin		
52. Pea mosaic virus, Doolittle and Jones 1925	**Pisum sativum** pea	Central Anatolia		(Bremer 1948 a)
	Vicia faba Broad bean	Central Anatolia		(Bremer 1948 a)
	Medicago spec. Lucerne, alfa-alfa	Central Anatolia		(Bremer 1948 a)
53. Sugar beet yellows, Roland and Quanjer	**Beta vulgaris** Sugar beet	Eskişehir, Amasya		(Gediz 1953)
	Sugar beet	it has been seen wherever the sugar beet is grown		(Tanrısever 1959)
	Eggplant	İzmir		(Özalp 1964 a)
54. Sugar beet curly top virus, Beneguet and Hartung 1915	Beet	Eskişehir		(Tanrısever 1957, Bennet and Tanrısever 1959)
	Bean	Ankara		(Özkan 1958)
55. Beet mosaic virus, smith 1957	Beet	in some places		(Tanrısever 1957)

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
56. Potato leaf roll virus, Appel 1911	potato	in several places	very high	(Bremer 1948 a,b, Özkan 1958, Karaca 1961)
	potato	İzmir		(Özalp 1962, 1964 b, Benlioğlu and Özalp 1965)
	potato	Nevşehir	up 80*	
		Bolu, Bursa, Trabzon, Kayseri		Sahtiyancı and varlı 1966)[21]
		Ordu	2,5	(Özbaş and Ayaydın
		Trabzon	4,1	1968)[13]
		Gümüşhane-Samsun	3,5	(Özalp 1961)
	Tomato	İzmir		
57. Potato virus Y. Valleau and Johnson	Potato var.	Several places		(Bremer 1948 a,b, Özkan 1958, Karaca 1961)
		Aegean Region	13—30	(Özalp 1962, 1964 b)
	cosima	Sakarya	57,8	(Sahtiyancı and varlı
	Cosima, Hendek,	Bolu	47	1966)[12]
	Deliören, local Potato var. from Holland (from ödemiş)	Bursa		»
	Trabzon, sarıkız	Edirne, Kırklareli,	36	»
	local, cosima	İzmir, Niğde,	20.3	(Özbaş and Ayaydın
		Trabzon	23.9	1968)[13]
		Gümüşhane	28.6	
		Samsun	24.6	

12) Ş. Sahtiyancı, G. Varlı. 1966. Project no. 107815. Annual Report. Regional Plant Protection, Research Inst. Erenköy, İstanbul.

13) O. Özbaş and F. Ayaydın 1968. Project no. 108709. Annual report. Regional Plant Protection Research Inst. Samsun.

	Ordu, Cosima, Sarıkız, Kemaliye, Alman 715, 716, and potato var. from Ödemiş	Ankara, Afyon, Konya Nevşehir	50*	
	Tomato			(Özalp 1961)
	Denizli, Muğla, Uşak, Çanakkale			
58. Potato Virus X Smith, 1957	Potato	Several places in Turkey		(Bremer 1948, a,b; Özkan 1958, Karaca 1961)
		İzmir		(Özalp 1962, 1964 b, 1965)
		Ordu	20,2	(Özbaş and Ayaydın 1968)[13]
		Trabzon	25,5	
		Gümüşhane	32,5	
		Samsun	29,9	
	Potato var .	Sakarya	38,2	(Sahtiyancı and Varlı 1966)[12]
	Cosima, Hendek, Deliören, local Hollanda	Bolu, Bursa, Edirne, Kırklareli		
	Local, Ordu, Kemaliye	Ankara, Afyon Konya, Nevşehir	up 80*	
	Cosima, Sarıkız Alman 715-716			
	Tomato	İzmir, Manisa, Aydın, Denizli, Muğla, Uşak, Kütahya, Çanakkale, Balıkesir		(Özalp 1961, 1964 a)
	Pepper	İzmir		(Özalp 1964)
59. Potato Aucuba Mosaic Virus, Murphy and Quanjer	Potato	İzmir		(Özalp 1962, 1964 b)
		Bursa, Niğde		(Sahtiyancı and Varlı 1966)[13]

14) O. Özalp and T. Azeri 1966. Project no. 105309. Final report. Regional Plant Protection Inst. Bornova, İzmir.

Virus	Host Plants	Place of occurence (Region, Province or County)	Distribution ratio %	References
		Ordu, Trabzon	0,1	(Özbaş and Ayaydın
		and Samsun	0,2	1968)[13]
		Gümüşhane		
60. Potato virus A, Murphy and McKay, 1932	Potato	Central Anatolia, Aegean Region		(Bremer 1948 a,b; Özkan 1958, Karaca 1961)
		İzmir		(Özalp 1962, 1964 b)
	Sarıkız, Cosima	Sakarya, Bolu, Bursa,	up 50*	
	Potato var.	Edirne, Afyon, Ankara Konya		(Sahtiyancı and Varlı 1966)[13]
61. Potato Virus S, van slogteren	Potato	İzmir		(Özalp 1962, 1964 b)
62. Potato Virus M		İzmir		(Özalp 1962, 1964 b)
63. Potato Spindle Tuber virus , Goss	Potato	İzmir		(Özalp and Azeri 1966)[14]
	Potato var.	Edirne, Kırklareli	40—10	(Sahtiyancı and Varlı 1966)[13]
64. Stolbur disease (Mycoplasma)	Potato var.	Bolu, Sakarya	40—80	(Sahtiyancı 1966)
	Cosima, Sarıkız	Sakarya, Bolu,		
	several var .	Edirne, Kırklareli,	end of	(Sahtiyancı and Varlı
		İzmir, Afyon,	vegetation	1966)[12]
		Niğde, Kayseri	up 75	
		Erzurum, Trabzon		
	Nevşehir local	Nevşehir	more than 70*	

65. Potato Bouquet Disease	Potato	Ankara		(Özkan 1958)
(Nicotiana virus 12 Smith)	Egg Plant	İzmir		(Özalp 1964 a)
66. Onion yellow Dwarf virus, Melhus et al.	**Allium cepa** Onion	Yalova		(Temiz et al. 1968)
67. Phyllody virus of sesamum	Sesam var.		40—50	(Arı and Türkmenoğlu 1959)
68. Tulipa virus 1 Smith	Tulipa Narcissus			(Bremer 1954)
69. Rosa virus 1	Rosa			(Bremer 1954)

ÖZET

TÜRKİYE'DE KÜLTÜR BİTKİLERİNDEKİ VİRUS HASTALIKLARININ SAPTANMASI

Bu çalışma bugüne kadar Türkiye'de kültür bitkilerinde hangi virus hastalıklarının tesbit edildiğini literatürlerden inceleyerek ve mahalli tetkik ve incelemelere dayanarak bunların sinonimlerinin, yayılışlarının, ekonomik önemlerinin, konukçularının, belirtilerinin, bulaşma yollarının, hastalıktan korunma ve kontrol yollarının neler olduğunu göstermek amacıyla yapılmıştır.

Bu amaçla yayınlanmış eserlerden başka Türkiye'de yapılmış fakat yayınlanmamış çalışmalar da gözden geçirilerek, buradaki incelemelerden de istifade edilmiştir.

Ayrıca Akdeniz, Ege, Marmara ve Orta Anadolu Bölgelerindeki başlıca sebze, meyve bahçeleri ve tarlalardaki bitkiler genel olarak gözden geçirilmiş ve sayımlar yapılarak ortalama hastalık bulaşma oranları ve yayılma alanları tesbit edilmiş ve bir liste halinde verilmiştir.

Memleketimizde virus hastalıkları konusunda çalışmalar, uzun yıllar bir sisteme bağlanmaksızın, muhtelif kimseler tarafından muhtelif zamanlarda çeşitli bitkiler üzerinde ve daha çok makroskobik gözlemlere dayanarak yapılmıştır.

Son yılarda ise memleketimizde bilhassa turunçgiller, bağ, patates incir ve bazı sebze virusları üzerinde kıymetli çalışmalarda, virusların teşhisi, yayılma alanı, bulaşma oranı, belirtileri, konukçuları, bulaşma yolları, hastalıktan korunma ve kontrol yolları incelenerek bu hastalıkların memleketimizin her tarafına yayıldığı, bitkilerde önemli zararlar yaptığı, ortaya çıkarılmıştır. Ancak bu hastalıklardan pek çoğunun halen memleketimizde yayılma alanı, bulaşma oranı ve bitkilerde sebep olduğu ürün kaybı bilinmemekte ve araştırmayı gerektirmektedir.

Sert ve yumuşak çekirdekli meyve ağaçları, tahıllar, pamuk, zeytin, çilek, süs bitkileri ve meyvesiz ağaçlarda ise zaman zaman bazı viruse benzer hastalık belirtileri görülmüş ancak bu belirtilerin pek çoğunun etmenleri üzerinde araştırma ve teşhis henüz yapılamamıştır. Görülüyor ki memleketimizde bitkilerde önemli zararlara sebebiyet veren ve çeşitli yollarla gayet kolay bulaşma imkânına sahip olan ve yayılmış bulunan virus hastalıklarının pek çoğunun etmenlerinin kat'i teşhisi, yayılma alanı ve yolu, bulaşma oranı, konukcu bitkileri, ekonomik önemi, hastalıktan korunma yolları bilinmemektedir. Bu nedenle bir yandan bu hususlar üzerinde çalışmalar ilerlerken bir yandan da bilhassa dış memleketlerde bu konuda yapılan çalışmaların günügününe takip edilmesi ve vakit kaybetmeden de virus vektörleri, virusa mukavim ve virustan arınmış çeşit yetiştirme üzerinde araştırmalara girmek gerekmektedir.

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All Correspondance Should Be Made To

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