VOLUME : 19 NUMBER : 1 JAN. 1990

THE JOURNAL OF TURKISH

PHYTOPATHOLOGY

PUBLISHED BY THE TURKISH PHYTOPATHOLOGICAL SOCIETY

The Journal of Turkish Phytopathology is published by Turkish Phytopathological Society and issued twice or three times a year to from volume. The subscription rate per volume is $ 21.00

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Bu derginin basımında TÜBİTAK desteğinden yararlanılmıştır.
Doğruluk Matbaacılık San. ve Tic. Ltd. Şti. İZMİR - 1990

J. Turk Phytopath., Vol. 19, No:1, 1-5 ,1990 ISSN 0378-8024

Investigation on The Detection and Seed Transmission of The Virus Diseases Occurring on Pulse Crops in Aegean Region

2. Seed transmission of virus diseases by grower seeds and seeds of artificially infected pulse crops.

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ABSTRACT

Seed transmission of viruses, has been studied through this study by testing the seeds obtained from artificially infected plants as well as the seeds obtained from local growers. Virus infections were detected with all grower seeds, except chickpeas samples. With artificially inoculated pulse crops, all viruses tested were transmitted by seeds, except AMV and BYMV.

INTRODUCTION

Virus diseases have been known for a long time on pulse crops and are of widespread occurrence causing economically important losses. A great deal of extensive studies have been made with pulse crops viruses. These viruses have been reported to be transmitted by the seed (1, 4, 8, 9, 10, 13, 18, 19, 20).

In this study, considering the importance of seeds as the source of viruses in the fields, transmissibilities through pulse crop seeds obtained from growers and artificially infected plants, with 13 isolates, were tested an ***Chenopodium amaranticolor*** and ***C. quinoa*** have been used as test plants.

MATERIALS and METHODS

1. Assay of seed transmission by grower seeds :

Three hundered seed samples for each legume variety, collected from the growers in the region, have been seeded in steril pot soil in the greenhouse. After the symptoms had developed, ***C. amaranticolor*** and ***C. quinoa*** were inocu-

lated by mechanical inoculation technique (table 1). Then these samples were homogenenized with mortar and pestle using 0.1-0.01 M phosphate buffer pH.7.0 For bean samples 0.1 %2-Mercapto-ethanol and for soybean samples citrate buffer and 0.1 %2-Mercapto-ethanol were added to this buffer. In addition, small amount of carborandum dust (500 Mesh) was added into the inoculum as an abrasive. Then the inoculum was applied to host plants mechanically. After inoculations the leaves were rinsed with tap water. Primary leaves of leguminosae plants, and 3-4 true-leaf stages of other hosts were used in these inoculations. The test plants were observed after inoculations for symptom development.

2. Assay of seed transmission by infected plants.

The primary leaves of seedling-bacthes of hundered obtained from healthy seeds of 7 pulse crop varieties were inoculated with 13 different virus isolates. These seedlings have been protected against pest and diseases and then seeds have been harvested from these plants seperately. Seeds, harvested from one plant, have been accepted as one sample and seeded in pots. Seedlings developed from these seeds, under the greenhouse conditions in steril pot-soil, have been observed. The plants, showing virus symptoms, have been evaluated separately. Infected leaves, collected from each plant, and then the extracts have been inoculated on the ***C. amaranticolor*** and ***C. quinoa*** by mechanical inoculation technique (Table 2). Test plants have been protected against pest and diseases.

RESULTS and DISCUSSION

It has been found that Alfalfa mosic virus is not transmitted by seed according the results of this study carried out with the isolates obtained from chickpea (N-1 isolate) and lentil (M-2 isolate). It is recorded that (11, 12) Alfalfa mosaic virus is transmitted by alfalfa but not by chickpea and lentil seeds. Chickpea seeds collected from growers have been found virus-free but lentil have been found infected at the ratio of 1.3%.

The broadbean seeds, harvested, from the Broadbean stain virus (Ba-1, Ba-19 isolates) infected plants, have been found infected at the ratio of 20-23%. The broadbean seeds collected from the growers have been found infected at the ratio of 1.6%. It is indicated by several workers that the diseases is transmitted by 10% by seed (14, 15).

The seed transmission of the Bean yellow mosaic virus, isolated from bean (F-3, F-67 isolates) and broadbean (Ba-2 isolate) and pea (Be-2 isolate), has not been brought in to light by this study. Some records indicate that it is transmitted at the ratio of 0.1-2.4% but some not (2, 9, 13).

By this study it has been found that Bean common mosaic virus isolated from beans (F-62 isolate) is transmitted by seed at the ratio of 56%. Grower's bean seeds have been found infected at the ratio of 3.6%. According to the litera-

ture cited this ratio is given as 5-90% (20-22).

Cowpea seeds, harvested from the Cowpea aphid borne mosaic virus (Bö-1 isolate) and Cucumber mosaic virus (Bö-26 isolate) infected plants, have been found infected at the ratio of 16% and 3.3% respectively in the region. Meanwhile grover's cowpea seeds have been found virus infected at the ratio of 6%. According the several records this ratio fluctuates between 0-28% (3, 5).

The pea seeds, harvested from Pea seed borne mosaic virus (Be-9 isolate) infected plants, have been observed. It was seen that they were infected at the ratio of 76%. Growers's pea seeds have been found infected by the ratio of 6.6%. According to the literature, transmission is between 0-100% (6, 16).

It is found by this study that transmission of the Soybean mosaic virus (S-1 isolate) by seed is 18%. Grower's seeds have been found as infected with virus disease by 1.6%. According the several records, this ratio changes between 0-94% (7, 17, 21).

ÖZET

Ege Bölgesinde Baklagillerde Görülen Virus Hastalıklarının
Tanılanması ve Tohumla Taşınma
Durumlarının Belirlenmesi Üzerinde Araştırmalar

2. Çiftçi tohumlarında ve viruslu bitkilerden elde edilmiş tohumlarda taşınma

Ege Bölgesi yemeklik baklagil ekim alanlarından, her bitki çeşidi için 300 tohum olacak şekilde, tohum örnekleri toplanmıştır. Üreticiden alınan bu tohumların, viruslu olup olmadığını araştırmak amacıyla testler yapılmış ve nohut dışındaki tüm çeşitlerin tohumlarının virusla bulaşık olduğu saptanmıştır.

Yemeklik baklagillerden izole edilen virusların tohumla taşınıp taşınmadığı da araştırılmıştır. Nohut ve mercimeklerde, AMV (yonca mozayık virusu)'nun, bakla, fasulye ve bezelye'de, BYMV (fasulye sarı mozayık virusu) nun tohumla taşınmadığı saptanmıştır. Baklalarda; BBSV (bakla, benek virusu)'nun %20-23, fasulyelerde; BCMV (fasulye adi mozayık virusu)'nun %56, börülcelerde, C abMV (börülce afid kökenli mozayık virusu)'nun % 16, CMV (hıyar mozayık virusu)'nun %3.3, bezelyelerde; PsbMV (bezelye tohum kökenli mozayık virusu)'nun %76, soyafasulyesinde; SMV (soyafasulyesi mozayık virusu)'nun %18 oranında tohumla taşındığı belirlenmiştir.

Table 1. Seed transmission by grower's seeds.

pulse crops	Chickpea	Broad bean	Bean	Lentil	Cowpea	Pea	Soybean
variety	Napolyon	Sakız	Çalı	Yeşil	Karagöz	sprinter	Williams
seed transmission %	0	1.6	3.6	1.3	3.3	6.6	1.6

Table 2. Seed transmission by infected plants.

Pulse crops	Variety	isolates	seed transmission %
Chickpea	Napolyon	N-1	0
Broad bean	Sakız	Ba-1	20
Broad bean	Sakız	Ba-19	23
Broad bean	Sakız	Ba-2	0
Bean	Dermason	F-3	0
Bean	Dermason	F-67	0
Bean	Dermason	F-62	56.8
Lentil	Yeşil	M-2	0
Cowpea	Karagöz	Bö-1	16
Cowpea	Karagöz	Bö-26	7
Pea	Sprinter	Be-2	0
Pea	Sprinter	Be-9	76
Soybean	Williams	S-1	18

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J. Turk Phytopath., Vol. 19, No:1, 7-12, 1990 ISSN 0378-8024

Investigation on The Susceptibility of Economicaly Important Almond Varieties Against "Pseudomonas amygdali" Psallidas and Control Measures In Aegean Region Almond Orchards - TURKEY

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ABSTRACT

Through this study the susceptibility of 15 almond varieties has been studied and control measures have been searched. Two applications, one is in autumn at 75% leaves fall stage with 3% the second in spring at the pink bud stage with 1% bordeaux mixture have given satisfactory results. Out of 15 varieties; 101-23, Texas, 104-1, Nonpareil, 120-1, 109-1 and 300-1 have been observed as resistant against this disease respectively.

INTRODUCTION

One third of the almond trees of Turkey is planted in Aegean Region. Acreage of the almond plantations has being steadly increased in Izmir, Muğla and Denizli proviences (Anonymus, 1978).

Muğla is the most conspicuous among the others with regard to production of almond. According to Gündoğdu et all. (1976), it has been found that the ratio of the disease in Datça (Muğla) is 13.5%. But the disease is localised only in a limited area. It has been found that the disease agent is ***Ps. amygdali.*** Psallidas et all. (1968) states that the same disease causes great damages in the almond orchards in Crete Island-Greece.

MATERIALS and METHODS

A - Control of the disease

7 spraying programs, indicated below, have been carried out at several stages to control the disease.

1. After harvest (3% bordeaux mixture)
2. 75% leaf-fall in autumn (3% bordeaux mixture)

3. Pink bud stage (1 % bordeaux mixture)
4. After harvest + autumn (3 % bordeux mixture)
5. After harvest (3 % bordeaux mixture) + pink bud stage app. (1 % bordeaux mixture).
6. After harvest (3 % bordeaux mixture) + autumn app. + pink bud stage app. (1 % bordeaux mixture)
7. Autumn app. (3 % bordeaux mixture) + pink bud stage app. (1 % bordeaux mixture)

The study was done with 8 characters and 3 replications according to the randomized blocs design. Two trees were one plot.

Counting of cancer on the trees was carried out on 14. July. 1981. 200 of yearly shoot in four different sides from each trees were counted as diseased and healthy. Effects of bactericides were evaluated according to Abbott and done Variance Analyse.

B. Determination of the suspectibility of several almond varieties.

Alibey, Akbadem, Kababağ, 300-1, Nonpareil, 120-1, Texas, 104-1, 101-23, 106-1, 101-9, Tuono, Davey, 5-1 and 101-13 almond varieties have been tested against the disease. The density of bacterial suspension used in the study was $3x10^8$ cell/ml according to Mc Farland scale (Kiraly, 1970). Inoculation was done in accordance with Psallidas et al (1975) 30 % of leaf was observed. One drop from 1 ml of bacterial suspension was given to each of five leave traces on each yearly shoot, totally on ten yearly shoot from each tree. Each variety had five trees and one tree was accepted as one replication. Counting was done on the leave-traces in July and disease ratio was determined.

RESULTS

A. Control of the disease
Results, for 1981, have been given on table (1).

Table 1: Effectivenness of spraying programs carried out in Yazı (Datça) village - 1981.

Characters	Replications	Shootings examined		Disease ration	Efficacy	Efficacy on average
		Diseased	Healty			
After harvest	I	107	293	26.75	47	
	II	98	302	24.5	53	46.33 a
	III	110	290	27.5	39	
75 % leaf fall in	I	51	349	12.75	75	
autumn	II	60	340	15.0	71	72.00 b
	III	48	352	12.0	70	
Pink bud stage	I	53	347	13.25	73	
	II	48	352	12.00	77	75.00 b
	III	44	356	11.0	75	
After harvest+	I	65	335	16.25	67	
autumn	II	60	340	15.0	71	71.66 b
	III	40	359	10.25	77	
After harvest+	I	81	319	20.25	59	
pink bud stage	II	65	335	16.25	68	70.00 b
	III	30	370	7.5	83	
After harvest+	I	6	394	1.5	97	
autumn app.+	II	18	382	4.5	91	95.33 c
pink bud stage	III	4	396	1.0	98	
Autumn app.+	I	9	391	2.25	95	
pink bud stage	II	16	394	4.0	92	90.33 c
	III	28	372	7.0	84	
	I	200	200	50.0	-	
Control	II	209	191	52.5	-	-
	III	192	208	48.0	-	

B. Determination of the susceptibility of several almond varieties.
The results, for the 15 varieties, have been given in Table 2.

Table 2. Susceptibility of several almond varieties against *Ps. amygdali*

Varieties	Replications	Cancer numbers	Free From Cancers	Disease ratio	Disease ratio on average
Hacı Ali Bey	I	45	5	90	95.6 b
	II	50	0	100	
	III	47	3	94	
	IV	49	1	98	
	V	48	2	96	
Akbadem	I	49	1	98	96.6 b
	II	50	0	100	
	III	50	0	100	
	IV	50	0	100	
	V	50	0	100	
Kababağ	I	28	22	56	68.0 e
	II	42	8	84	
	III	38	12	76	
	IV	35	15	70	
	V	27	23	54	
300-1	I	26	24	52	49.6 g
	II	29	21	58	
	III	32	18	64	
	IV	37	23	46	
	V	36	14	28	
Nonpareil	I	13	37	26	41.0 i
	II	23	27	46	
	III	22	28	44	
	IV	22	28	44	
	V	23	27	46	
120-1	I	26	24	52	41.2 i
	II	26	24	52	
	III	16	34	32	
	IV	13	37	26	
	V	22	28	44	
Texas	I	26	24	52	31.6 j
	II	9	41	18	
	III	8	42	16	
	IV	21	29	42	
	V	15	35	30	
104-1	I	24	26	48	45.2 i
	II	29	21	58	
	III	22	28	44	
	IV	18	32	36	
	V	20	30	40	
101-23	I	0	50	0	5.6 k
	II	2	48	4	
	III	3	47	6	
	IV	9	41	18	
	V	0	50	0	

Varieties	Replications	Cancer numbers	Free From Cancers	Disease ratio	Disease ratio on average
106-1	I	47	3	94	68.4 d
	II	37	13	74	
	III	24	26	48	
	IV	34	16	68	
	V	29	21	58	
101-9	I	34	16	68	46.4 h
	II	16	34	32	
	III	21	29	42	
	IV	17	33	34	
	V	28	22	56	
Tuono	I	50	0	100	100.0 a
	II	50	0	100	
	III	50	0	100	
	IV	50	0	100	
	V	50	0	100	
Davey	I	50	0	100	100.0 a
	II	50	0	100	
	III	50	0	100	
	IV	50	0	100	
	V	50	0	100	
5-1	I	50	0	100	90.0 c
	II	50	0	100	
	III	35	15	70	
	IV	42	8	84	
	V	48	2	96	
101-13	I	15	35	30	56.0 f
	II	42	8	84	
	III	14	36	28	
	IV	23	27	46	
	V	46	4	92	

DISCUSSION

Through this study, several application programs have been evaluated, as one or two or three applications together. However disease can be inhibited at 46.33-75.00 % by one application but 70.00-90.00 % by two applications together. Three applications together give a control of 95.33 % but is not economic. So two applications; the first in autumn at 75 % leaves fall stage with 3 % and the second in spring at the pink but stage with 1 % Bordeax mixture, have been given to the practice.

Tuono, Davey, Akbadem, Hacı Ali Bey, 5-1, 106-1, Kababağ and 101-13 varieties have been found susceptible but 101-23, Texas, Nonpareil, 120-1, 104-1, 101-9 and 300-1 are more resistant against the disease respectively.

Ps. amygdali is problem in Yazı (MUĞLA) since the susceptible Akbadem, Hacı Ali Bey and Kababağ varieties are planted.

ÖZET

EGE BÖLGESİ BADEMLERİNDE GÖRÜLEN
BADEM AĞACI KANSERİ (*Pseudomonas amygdali* Psallidas)
HASTALIĞININ SAVAŞIM YÖNTEMLERİ
VE BÖLGENİN ÖNEMLİ BADEM ÇEŞİTLERİNİN
DUYARLILIKLARININ SAPTANMASI ÜZERİNDE ÇALIŞMALAR

Ege bölgesi bademlerinde görülen Badem Ağacı Kanseri (*Pseudomonas amygdali* Psallidas) hastalığının mücadele metodlarını ve bölgenin önemli badem çeşitlerinin duyarlılıklarını saptamak amacı ile çalışma 1980-1988 yıllarında Datça (MUĞLA)'nın Yazı köyünde ve enstitü bahçesinde yürütülmüştür. 1980-1981 yıllarında Datça'nın Yazı köyünde yürütülen denemenin sonunda söz konusu hastalığa karşı sonbaharda kuru ve çok hastalıklı dallar kesildikten sonra yerine % 5 oranında göz taşı eriyiği ve kuruduktan sonra da nebati katran sürülmüştür. Yapraklar % 75 oranında döküldüğü devrede % 3 ve ilkbaharda pembe dönem devresinde % 1 oranında bordo bulamacı uygulaması tatminkar sonuç vermiştir.

Bölgenin önemli 15 badem çeşitlerinden sırasıyla 101-23, Texas, 104-1, Nonparel, 120-1, 109-1 ve 300-1 *Ps. amygdali* etmenine dayanıklı bulunmuştur. En duyarlı çeşitlerini ise, sırası ile, Tuono, Davey, Akbadem, Hacı Ali Bey, 5-1, 106-1 ve Kababağ oluşturmuştur.

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J. Turk Phytopath., Vol. 19, No:1 , 13-19 , 1990 ISSN 0378-8024

Investigations on the Incidence of Tobacco Charcoal Rot Disease (**Macrophomina phaseolina** (Tassi.) Goid.) in the Aegean Region, Its Pathogenicity and Susceptibility of Turkish Tobacco Cultivars

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ABSTRACT

In this study, according to surveys carried out in Izmir for two years (1985-86) the mean of incidence of the charcoal rot disease of tobacco was estimated to be 53,75 %. 52 isolates which selected from collected specimen, showed variation in their pathogenicity (0-100%). 24 tobacco cultivars/lines grown in Turkey tested against two virulent isolates were all found to be susceptible to the pathogen.

INTRODUCTION

Turkey is the pioneer country for producing caused high quality oriental type of tobaccoes. Tobacco, is one of the most important export crop, and is commonly grown in all regions of Turkey, particularly where the soils are deficient for nutriment and poor for any other crops.

Various studies on charcoal rot disease caused by ***Macrophomina phaseoline*** have been exclusively carried out in several countries.

REICHERT (1977), declared that ***R. bataticola*** was isolated from 35 plant species and it mostly damaged to phaseolus, tobacco, sesamum, potato, sweet potato, sugar melon, pepper and tomato in Palestine. WYLLIE and ROSENBROCK (1985) reported that the fungus had a host range of about 400 plant species. A research done at Sırbistan (Yugoslavia) showed that the incidence of charcoal rot could occur up to 98% in corn (PENCIC, 1977). BREMER (1944), reported that it caused an epidemy on tobacco in 1938 and he mentioned that the incidence of the disease of tobacco in same year, was 10-90% in Aegean region and total reduction in harvest was 6%. BORA (1970) found out that ***M. phaseolina*** was one of the fungi caused damping-off in the seedbeds of tobacco. KARCILIOĞLU et al. (1985), carried out some studies on sesame and Soybean in Aegean region, they found out that the disease incidence was 6,2 % and 8,02

% in the 1983 and 1984 respectively. There are several studies on the pathogenicity of the pathogen and susceptibility of the crops against to this fungus in the world.

IBRAHIM et al (1979), claimed that pathogenicity seemed to be the most reliable criterion for identification. EL-DAHAB et al. (1983), studied on charcoal rot of sunflower and grouped 16 isolates as virulent, moderately virulent and weakly virulent. MORE et al. (1982) has not come accrossed with immun lines among 13 sesame cultures tested under natural conditions. They found out that the incidence was being min. 20-54% on 2077-B.

This research aimed at :

- To find out the disease incidence of charcoal rot in İzmir area by surveys,
- To find out variation in the pathogenicity of ***M. phaseolina*** isolates selected from five provinces samples in Aegean region, and the reactions of Turkish tobacco cultivars or lines against selected two virulent isolates of the fungus.

MATERIALS and METHODS

For finding the incidence of the disease were carried out only in 14 towns or 36 villages of İzmir province for two years (1985 and 1986). Tobacco fields over one decar large were randomly chosen and countings were done on 20 plants in five rows from te corners and the centers of each field surveyed.

Number of samples were determined as one sample per 15.000 bale in towns of five cities (Aydın, Balıkesir, Izmir, Manisa and Muğla) (x) BORA and KARACA (1970) were refered in order to determine the incidence rate and sampling studies.

Isolates of ***M. phaseolina*** used in this study were obtained from the diseased plant samples collected from five cities. To identify the pathogenicity of 52 isolates selected for various cultural characteristics were used six tobacco cultivars (İzmir - Özbaş 317/5, Karabağlar 6265, Bursa 188/35, Samsun-Maden 2421, İzmir-İncekara 101/215, and Burley 37).

Isolation of the pathogen was realized by cutting of the basal part of the plant into three pieces, each of 1 cm, disinfecting in the NaHCl 0,5% for two min., and after washing under steril water placing on the PDA (PENCIC, 1977).

Tobacco seedlings used in pathogenicity and reaction tests were pulled up at three to six foliar stages. Roots were rinsed with top water and wounded by means of cutting, and then they were dipped in the inoculum for 20 minutes. The seedlings of each cultivar were planted into four pots autoclaved and filled with 700 gr soil fumigated. Each pot consisted of three seedlings. The remaining inoculum of 100 ml were divided up equally to each pot and the pots were placed in

(x) Ege Tütün İhracatçıları Birliği, 1981 Yıllığı.

chamber with 15 h. lighting at 25 ∓ 2°C.

To prepare the inoculum the agar pieces of original culture of selected ***M. phaseolina*** isolates were sown on 100 ml PD medium and kept in an incubator at 30°C for 10 days. (DHINGRA and SINCLAIR, 1975). Two virulent isolates of the fungus were used in the reaction tests of 24 tobacco cultivars / lines.

Statistical analyses were conducted depending on the number of diseased plants (dead / wilted) which were counted in 15 days after inoculation, in pathogenicity and susceptibility tests.

RESULTS and DISCUSSION

Surveys were conducted in two consecutive years (1985 and 1986) in selected towns or villages of İzmir provinces. Very high infection rates were found in some fields. The mean infection rate of two years over locations was calculated to be 53,75% which means more than half of tobacco crops is affected by charcoal rot disease. The countings were done between the end of July and beginning of September. This is a logical explaination for very high countings of diseased plants. The results are in accordance with BREMER (1944)'s findings. He reported that, the disease incidence was 10-90% in Tire and Selçuk 20-80% in Menemen and İzmir and 70% in Aydın, 50-60% in Çine in 1938. And in 1939 it was 40-50% in Izmir-Çiğli, 5-10% in Menemen and 50% in Aydın. He also stated that the disease incidence increased as the time proceeded.

According to statistical analyses, 52 isolates were grouped depending on then virulence. Some isolates were more virulent than the others (Table 1).

They were grouped into four categories as given below according to the numbers of wilted and dead plant of six tobacco cultivars: 1-15 % weakly virulent, 16-40 % moderately virulent, 41-70% markedly virulent, 71-100 % strongly virulent. This grouping was also used by DHINGRA and SINCLAIR (1973). REICHERT and HELLINGER (1947) applyed this system as pre-emergence and post-emergence. Pathogenicity of isolates studied was found as 0 to 100% which means that there are large variations for this trait. In the studies of DHINGRA and SINCLAIR (1973), SULAIMAN and PATIL (1977) the pathogenicity was found between 0-83% and 59,4-100 %, respectively.

Also in this research reaction of 24 tobacco cultivars / lines were evaluated against two virulent isolates of ***M. phaseolina.*** The reactions of cultivars were similar. However there was some differences in their susceptibilities due to the genetic make-up (Table 2). Most cultivars were found to be sensitive to both isolates. They showed 25-100% disease rate. These were grouped as 25-60% and 61-100% disease rate. QADRI and DESHPANDE (1983) used similar grouping for sunflower.

Since the studies on this disease are not sufficient in Turkey, this research is a basic study of charcoal rot disease on tobaccoes caused by ***M. phseolina.*** By the results of this study some basic knowledge about the disease, such as disease incidence, pathogenicity of the isolates and reactions of Turkish tobacco cul-

tivars were obtained in aegean region. It can be suggested that the yield reduction caused by the disease should be found out. If this reduction is at economic levels all means of controlling the disease should be investigated.

Table 1: Pathogenicity of ***M. phaseolina*** isolates within a observation period of 15 days.

No.	Isolate Number	Locations	Angle valuea of the disease rate	Groups (p=0.05)
1	49	Torbalı / İzmir	90.00	
2	50	Urla / İzmir	90.00	
3	48	Merkez / İzmir	90.00	
4	51	Çeşme / İzmir	90.00	
5	41	Ula / Muğla	87.21	
6	28	Bergama / İzmir	82.21	
7	24	Söke / Aydın	79.42	
8	25	Milas / Muğla	75.40	
9	8	Ovakent / İzmir	73.55	
10	36	Akhisar / Manisa	64.59	
11	29	Saruhanlı / Manisa	61.34	
12	26	Yatağan / Muğla	59.85	
13	40	Akhisar / Manisa	55.87	
14	34	Yatağan / Muğla	55.51	
15	37	Akhisar / Manisa	55.33	
16	39	Salihli / Manisa	50.90	
17	52	Kırkağaç / Manisa	49.35	
18	42	Turgutlu / Manisa	48.30	
19	12	Kınık / İzmir	47.79	
20	23	Karacasu / Aydın	47.14	
21	35	Gördes / Manisa	45.87	
22	33	Merkez / Muğla	45.69	
23	7	Kiraz / İzmir	44.20	
24	27	Çine / Aydın	41.41	
25	30	Yatağan / Muğla	41.09	
26	38	Merkez / Muğla	38.34	
27	10	Sarıgöl / Manisa	38.02	
28	3	Kınık / İzmir	31.24	
29	43	Sındırgı / Balıkesir	30.66	
30	1	Tire / İzmir	27.97	
31	6	Merkez / İzmir	27.82	
32	46	Merkez / Muğla	27.06	
33	2	Menemen / İzmir	25.76	
34	45	Saruhanlı / Manisa	24.85	
35	31	Ödemiş / İzmir	23.87	
36	5	Ödemiş / İzmir	23.19	
37	21	Fethiye / Muğla	22.86	
38	47	Akhisar / Manisa	22.64	
39	32	Merkez / Muğla	22.64	
40	22	Alaşehir / Manisa	22.33	

No.	Isolate Number	Locations	Angle valuea of the disease rate	Groups (p=0.05)
41	44	Bigadiç / Balıkesir	20.43	
42	4	Tire / İzmir	17.79	
43	11	Soma / Manisa	17.10	
44	16	Saruhanlı /Manisa	17.10	
45	9	Değirmendere/İzmir	16.92	
46	19	Gölmarmara/Manisa	11.81	
47	17	Sarıgöl / Manisa	9.02	
48	14	Kırkağaç / Manisa	7.79	
49	18	Sarıgöl / Manisa	5.58	
50	20	Fethiye / Muğla	2.79	
51	15	Saruhanlı / Manisa	2.79	
52	13	Soma / Manisa	2.79	

Table 2. Combined susceptibility order of 24 tobacco cultivars against the two isolates of ***M. phaseolina.***

Cultivar	Rate of the disease(%)	Number of the diseased Plant / 12	Number of the diseased plant (square root)	Groups (p=0.01)
İzm. İncekara 101/215	100	12	2.00	
İzm. Özbaş 917/5	100	12	2.00	
Samsun-Maden 2421	100	12	2.00	
Taşova 194/9	100	12	2.00	
K. bağlar 6265	100	12	2.00	
S.Maden 188/35	100	12	2.00	
Burley 37	100	12	2.00	
S. Canik 190/5	100	12	2.00	
Trakya-Özbaş 198/20	91.66	11	1.89	
Bursa 18000	83.33	11	1.89	
Yayladağ 18205	83.33	10	1.88	
Malatya 676	83.33	10	1.87	
Düzce-Özbaş 196/23	83.33	10	1.86	
Bafra 6391	83.33	10	1.86	
Taşova 10670	66.6	8	1.73	
Bafra 193/3	58.33	7	1.66	
Düzce 985	58.33	7	1.64	
Trakya 20292	58.33	7	1.61	
Basma 438	58.33	7	1.58	
S. Canik 10821	58.33	7	1.58	
Bursa 199/9	50.00	6	1.52	
Balıkesir 16880	41.66	5	1.48	
Basma 192/23	33.33	4	1.36	
Ege-64	25.00	3	1.27	

ÖZET

EGE BÖLGESİNDE TÜTÜNDE ÖZÜKURU HASTALIĞI (*M.phaseolina* (Tassi.) GOID)'NIN DURUMU, PATOJENİSİTESİ VE TÜRK TÜTÜN ÇEŞİTLERİNİN DUYARLILIKLARI ÜZERİNDE ARAŞTIRMALAR

Bu araştırmada, İzmir ilinde yapılan 2 yıllık (1985-86) sürveyde, tütünde özükuru hastalığına yakalanma oranı ortalama olarak %53,75 oranında saptanmıştır. Toplanan örneklerden seçilen 52 izolatla yapılan testlerde, izolatlar patojenisteleri açısından (% 0-100) farklı bulunmuş ve gruplandırılmışlardır. İki virulent izolatla reaksiyon testine alınan Türkiye'de yetiştirilen 24 tütün çeşit / hattının ***M. phaseolina***'ya karşı duyarlı oldukları saptanmıştır.

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J. Turk Phytopath., Vol. 19, No:1, 21-29, 1990 ISSN 0378-8024

The Preliminary Studies on The Turfgrass Diseases in Turkey

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ABSTRACT

In this study the pathogenic characters of the different fungi, isolated both on the seeds and the infected turfgrasses were examined.

*Different pathogens as **Rhizoctonia, Curvularia, Fusarium, Alternaria** and **Helminthosporium** were isolated from the diseased turfgrass plant. The rate of pathogens were 68.3, 68.6, 14.0 and 5.0 % respectively.*

*On the seeds, mostly **Penicillium, Alternaria** and **Aspergillus** species were isolated in addition to many other fungi. **Helminthosporium** species were also isolated from the Bermudagrass.*

*According to the pathogenicity tests; **Rhizoctonia, Fusarium, Helminthosporium** and **Curvularia** were determined as the most virulent fungal organisms.*

*Some of the turfgrasses such as **Lolium, Festuca, Poa** belonging to the different varieties which obtained from the seed companies were found to have different degrees of sensitivity to the above mentioned fungi.*

INTRODUCTION

Turfgrasses are used on grounds, surrounding business, parks sports grounds and roadsides. The significance of turfs cannot be neglegted. The ornamental beauty and aesthetic benefits was contribute to mental health and provide the more favorable environment for social interaction among peoples especially in densely populated areas.

The turfgrass's plant pathogenic problems are great especially in the fields to which new cultivars have been introduced. The lack of fundemental knowledge is very high, compared with the traditional agricultural commodity areas.

Emphasis was placed on ***Helminthosporium*** and ***Curvularia*** species among the determined fungal organism. In the early research in the turfgrass in 1941, a disease was reported where the turfgrass became chlorotic and thinned

during the hot weather. The causal agents were claimed as ***Curvularia*** or ***Helminthosporium*** (Wernham and Kirby, 1941).

Smiley (1983), indicated that 8 ***Curvularia*** species to be pathogenic to the turfgrasses. Brown et al. (1972) were reported that disease symptoms were primarily a leaf tip dieback where the tissue first become yellow and then brown and leaf finally shriveled Muchovej et al. (1985), reported that 23 species of ***Curvularia*** occurred on 29 species of grasses.

Hodges (1972), demonstrated that ***Curvularia geniculata*** could not clearly shown pathogenicity on ***Agrostis palustris*** or ***Poa pratensis.*** Hodges, concluded that ***C. geniculata*** is primarily a saprophyte and may be secondary invader of lesions caused by ***Drechslera sorokiniana.***

In another report, it was shown that ***Helminthosporium vagans*** was a blighting pathogen and occurred on the ***P. pratensis, P. compressa*** and ***P. trivialis.*** It was also reported on the ***Agrostis*** and ***Festuca*** (Brown, 1972).

A disease causing circular necrotic patterns in ***Poa pratensis*** was the first serious new problem in 1950's. The affected plants often occurred in the center of affected patches, forming a ring pattern. These symptoms were described as a single disease that was named ***Fusarium*** blight. According to the same research ***Fusarium*** was the most isolated pathogen on frequent clipped turfgrasses, it was also determined that ***Fusarium*** species were more aggressive to the ***Agrostis*** species than ***Poa*** sp (Smiley, 1987). Furthermore it was reported that many turf varieties were affected by ***R. solani*** (Bloom and Couch, 1960).

It was planned that kind of research because of the serious turfgrass diseases being occurred in our country, related with the increasing turfgrass fields as many countries done. The aim of this study was to determine the possible causal pathogens on the seeds and on the diseased plant parts and also to find out the susceptibility of some turfgrass varieties against to these pathogens.

MATERIALS and METHODS

Fungi isolated from the seeds and affected plant parts were ***Fusarium, Rhizoctonia, Curvularia, Helminthosporium*** and ***Alternaria. Festuca, Agrostis, Poa, Lolium, Agropyron, Bromus*** species and Bermudagrass were provided by various commercial tufrgrass seed companies.

Two different techniques were used to isolate the fungal flora on the seeds. The seeds were placed on moist filter paper (25 seeds per plate) within the petri plates and incubated at temperature 22-26°C in the dark for 48 hours. Then identifications were realized under microscope (Brown et al., 1972).

10 seeds of each variety were surface disinfested with 0.5% sodium hypochlorite (NaOCl) for 10 minutes. The seed samples were then rinsed in distilled water and plated onto Potato Dextrose Agar medium. Another 10 seeds were plat-

ed without disinfected with NaOCl but only distilled water. The identification of the fungi were realized after incubated at 22-24°C. Both of the treatments were replicated three times.

The seeds belong to various turfgrass varieties used in the pathogenicity tests were washed and dried after disinfection. (0.5 % sodium hypochloride for 10 minutes). The seeds were sown in 15 cm diameter clay pots containing a soil mixture of 1/3 turf, 1/3 sand, 1/3 soil. They were seeded at 0.058 to 0.085 g/pot depending on the varieties (Brown et al., 1972).

The turfgrasses were grown for 6 to 8 weeks and the crown of turfgrass plants had been clipped to 3 cm high at 24 hours prior to inoculation.

Isolates were grown on PDA for 8-10 days. Conidia were washed from the surface of fungal colonies (***Curvularia*** sp., ***Helminthosporium*** sp., ***Alternaria*** sp.) with distilled water. The suspensions were standardized to contain 300.000 - 350.000 spore / ml. The conidial suspensions were sprayed to run off on the foliage and crowns.

The tests with ***Rhizoctonia*** and ***Fusarium*** isolates were prepared in the cornmeal-sand medium and incubated at 21 days at room temperature. After the fungus had grown throughout the medium, the cultures were air dried just prior to inoculation. The test plants were cut to 3 cm in height, uniform amounts of the air dried inoculum were then scattered at 10 gr/per pot over the foliage.

After inoculation with both of two methods the pots of grass were covered with individual plastic covers to maintain the high humidity. The pots were incubated in a room with a temperature of 25 ± 1°C and received an illumination of 15 hours light and 9 hours dark.

After 10 days incubation period the plants were evaluated for symptom development. Disease severity in all experiments was rated by a 1-5 scale (Couch and Bedford, 1966; Brown et al., 1972). All treatments were replicated three times and the same techniques used in all turf varieties.

RESULTS

The results obtained from the studies, related with the identification of the fungal flora of turfgrass seeds provided by commercial seed companies were summarized at Table 1.

The given scores were the mean number of the different species of each genus ***Alternaria*** sp., ***Penicillium*** sp., ***Cladosporium*** sp. and ***Aspergillus*** sp. which were the most frequently isolated fungi, according to the different techniques used in all, of the turf varieties. ***Helminthosporium*** sp. known as a potential pathogen of turfgrasses was isolated only on the ***Festuca*** sp., ***Lolium*** sp. and Bermudagrass turf varieties.

The incidence of fungi, isolated from the two of the sport fields samples were shown at Table 2.

Table 1: The rate of presence of fungi, obtained in various trufgrass seeds.

Fungi	Festuca sp. (7 samples)			Poa sp. (4 samples)			Lolium sp. (5 samples)			Agrostis sp. (3 samples)			Bermuda grass (1 sample)			Agropyron sp. (2 sample)		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Alternaria	19.4	34.9	10.5	0.5	1.6	0.94	7.7	2.2	9.8	1.1	-	2.6	80.0	16.6	66.0	14.9	11.5	9.9
Fusarium	-	-	-	5.5	5.5	-	1.1	-	-	1.1	4.4	-	3.3	6.6	-	-	-	-
Cladosporium	1.1	0.5	0.94	1.1	2.2	-	-	-	0.9	3.3	4.4	-	3.3	3.3	-	3.3	3.3	-
Helminthosporium	-	0.5	-	-	-	-	-	1.1	-	-	-	-	3.3	6.6	1.3	-	-	-
Penicillium	2.2	3.3	2.6	3.8	2.7	-	4.4	-	0.5	4.4	7.7	0.4	-	-	2.6	1.6	3.3	3.3
Aspergillus	2.2	4.5	0.1	1.1	1.1	-	11.0	3.3	-	3.3	6.6	-	-	-	-	-	-	-
Vardomyces	2.7	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ulocladium	-	0.5	0.1	-	1.1	-	-	1.1	0.5	-	-	-	-	-	-	1.3	-	-
Others	3.8	7.6	-	-	-	-	-	3.3	-	-	1.1	1.1	-	-	-	-	-	-

1 : Disinfested seeds 2 : No Disinfested Seeds 3 : Blotter test

Curvularia spp. and ***Fusarium*** spp were the main fungi in both of two stadium samples. ***Rhizoctonia*** sp. and ***Helminthosporium*** sp. were the secondary fungi according to the isolation tests. Pathogenicity experiments were conducted by using the isolates which were obtained from both seed and affected plant parts. These selected isolates were 12 ***Curvularia*** 13 ***Fusarium*** , 6 ***Rhizoctonia*** and 5 ***Helminthosporium*** species.

According to the fungi's speciality, the results of the inoculations both of leaves and soil on the 5 turfgrass varieties were summerized at Table 3.

When the Table 3 was examined it was observed that, the rate of disease was obtained between 18 % to 52 %, with the isolates belonging to 3 fungi (***Curvularia*** sp., ***Helminthosporium*** sp., ***Alternaria*** sp.) except ***Lolium*** sp. Rather, the disease rate was reached pretty high percentage with ***Culvularia*** and ***Helminthosporium*** on ***Lolium*** sp. (80 % and 96 % respectively). Thus the ***Lolium*** sp. was the most influenced turf variety.

Table 2 : Incidence of the fungi isolated from infected turfgrass samples (%)

Fungi isolated	Ali eker Stadium (Trabzon)	Muğla Stadium (Muğla)
Curvularia spp.	43.3	93.3
Fusarium spp.	63.3	50.0
Rhizoctonia spp.	3.3	13.3
Helminthosporium spp.	0.0	10.0
Alternaria spp.	3.3	10.0
Others	6.6	6.6

Table 3 : The rate of disease in the various turfgrass, determined in the Pathogenicity tests.

Isolates	Festuca sp.		Agrostis sp.		Poa sp.		Lolium sp.		Bermudagrass	
	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil
Alternaria sp. (25 Isolate)	24	-	36	-	18	-	18	-	16	-
Helm. sp. (6 Isolate)	26	-	50	-	36	-	96	-	52	-
Curvularia sp. (12 Isolate)	28	30	36	30	24	16	80	40	20	20
Rhizoctonia sp. (6 Isolate)	-	40	-	46	-	30	-	70	-	60
Fusarium sp. (3 Isolate)	-	20	-	34	-	14	-	40	-	30

After the pathogenicity tests, the most virulent 2 ***Curvularia*** 2 ***Rhizoctonia***, 1 ***Fusarium*** and 1 ***Helminthosporium*** isolates were selected to the variety tests.

The variety reaction test were realized with 5 ***Festuca***,4 ***Lolium***,1 Bermudagrass varieties supplied by 4 Commercial seed componies. ***Lolium perenne***

preramo was the most affected turfgrass variety by both of leaf and soil-borne pathogens. Nevertheless, most of the ***Festuca*** species were influenced by the soil-borne pathogenes (Table 4 and 5).

Table 4 : The disease rates obtained with pathogenicity tests on ***Festuca*** species (%)

Isolates	Festuca rubra rapid		Festuca rubra rubina roshilde		Festuca ovina		Festuca rubra		Festuca r. Novarubra		Festuca ovina		Festuca rubra	
	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil
Rhizoctonia 8	-	60	-	92	-	100	-	86	-	100	-	72	-	100
Rhizoctonia 20	-	60	-	92	-	86	-	86	-	80	-	60	-	75
Fusarium 11	-	40	-	52	-	60	-	86	-	60	-	72	-	60
Curvularia 3	40	-	46	-	26	-	46	-	26	-	26	-	52	-
Curvularia 16	100	-	72	-	0	-	86	-	86	-	12	-	72	-
Helminthosporium 61	46	-	46	-	60	-	52	-	40	-	26	-	60	-

Table 5 : The disease rates obtained with pathogenicity tests on ***Lolium*** sp. and Bermudagrass (%)

Isolates	Bermudagrass		Lolium perenne ovation		Lolium perenne peramo		Lolium perenne		Lolium perenne		Lolium perenne	
	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil	Leaf	Soil
Rhizoctonia 8	-	60	-	80	-	92	-	86	-	80	-	72
Rhizoctonia 20	-	46	-	100	-	86	-	92	-	86	-	72
Fusarium 11	-	40	-	66	-	100	-	100	-	80	-	80
Curvularia 3	20	-	60	-	92	-	60	-	60	-	52	-
Curvularia 16	52	-	40	-	92	-	72	-	66	-	66	-
Helminth. 61	26	-	66	-	92	-	72	-	66	-	86	-

DISCUSSION

In the first step of this study, it was determined the fungal flora of the 23 seed samples supplied by the seed companies. The fungi found intensely in the seeds were *Alternaria, Penicillium, Cladosporium, Aspergillus* besides the others. The most frequently isolated fungi *Alternaria* spp. and *Helminthosporium* spp. which known as important pathogens of turfs were found on Festuca, Lolium and Bermudagras but not on all samples. However, another important seed borne pathogen *Curvularia* was not detected on the sampling of turf varieties (Table 1). The most frequently isolated fungus was *Alternaria* spp.

It was observed that *Curvularia* spp (% 68) and *Fusarium* spp (% 56) were usually isolated with high rates from affected turfgrasses. In addition to the others; *Rhicoctonia* spp. and *Helminthosporium* spp may be added as the main fungi (Table 2).

When compared with the findings in literature, it can be said that there are some similarities with the data we obtained. As a matter of fact, in the previous studies. *Curvularia* spp. and *Helminthosporium* sp. had been reported as being pathogens on various turf varieties (Wernham and Kirby, 1941; Brown, 1972; Smiley, 1983; Muchovej, 1985). Similar state is current for *Fusarium* spp. (Smiley, 1987) and *Rhizoctonia* spp. (Bloom and Couch, 1960).

As the results of Pathogenicity test (Table 3), it was found that virulent pathogens were *Helminthosporium* sp. and *Curvularia* sp. for leaf, *Rhizoctonia* sp. and *Fusarium* sp. for soil treatments. Essentially these results were in coincidence with previous turf disease reports. It had been studied with many *Alternaria* isolates because of frequently isolation of this pathogen from the seeds. But the less disease rates were obtained with these *Alternaria* sp. isolates (Table 3). *Lolium* sp. was the most influenced turf genus by both of leaf and soilborne pathogens.

Inoculation of 7 cultivars of *Festuca*, 5 of *Lolium* and Bermudagrass with virulent isolates were exhibited a very high rate of disease (Table 4 and 5). It was also observed that there are some differences between the fungal isolates regarding the virulence even in the same genus.

Generally *Lolium* spp were more affected by the both of leaf and soilborne pathogens than the Bermudagrass.

These results are the first data of the continuing research. These findings indicated that the diseases on turfgrasses may became also a problem in Turkey. It has been intended to study on the control of the turf diseases in the further studies.

ÖZET

TÜRKİYE'DE ÇİMLERDE GÖRÜLEN HASTALIKLAR ÜZERİNDE ÖN ÇALIŞMALAR

Bu çalışmada, hem çim tohumları üzerinden, hem de hastalıklı çim bitkilerinden izole edilen değişik fungusların patojenik karakterleri incelenmiştir.

Hasta çim örneklerinden, ortalama olarak % 68.3 ***Rhizoctonia*** spp, %68 ***Curvularia*** spp., %56 ***Fusarium*** spp., %14 ***Alternaria*** spp ve % 5 oranında ***Helminthosporium*** spp. izole edilmiştir.

Tohumlardan ise; pekçok fungusun yanısıra ağırlıklı olarak ***Alternaria*** spp., ***Penicillium*** spp ve ***Aspergillus*** spp. saptanmıştır. Bermudagrass çim çeşidinde ayrıca ***Helminthosporium*** türleri izole edilmiştir.

Yapılan pekçok patojenisite testinde; ***Rhizoctonia*** spp, ***Fusarium*** spp, ***Helminthosporium*** spp ve ***Curvularia*** spp etkin izolatlar olarak saptanmıştır.

Tohum firmalarından sağlanan değişik türlere ait çeşitlerin bu organizmalar karşısında farklı duyarlılıkta oldukları bulunmuştur.

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J. Turk Phytopath., Vol. 19, No:1, 31-39, 1990 ISSN 0378-8024

Chemical Control of Storage Rots In Ankara Pears

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ABSTRACT

Efficacy of six fungisides against three of the impartant storage rot agents was investigated at 0°C , 22°C, and the femperature of farmers strores.

At 22°C, none of the fungicides was effective on the three fungi, ***Penicillium expansum, Botrytis cinerea,*** *and* ***Alternaria tenuissima.*** *At farmers' stores and 0°C, carbendazim, thiabendazole, prochloraz and imazalil controlled both* ***P. expansum*** *and* ***B. cinerea*** *at more than 90 % of efficacy, for 3,5 months of storage period.*

INTRODUCTION

Control of storage rot of pome fruits can be achieved by either pre harvest spray or post harvest by dipping into fungicides. But, the more feasible and common method is the latter.

The most of the works related with chemical control have been done on artificially inoculated fruits and two ways have been suggested for the control. These are treatments to perform before and after inoculation and the farmers usually prefer the treatment after inoculation beause effectiveness decreasses proportionally based on the time gap between inoculation and treatment.

Treatment of fruits before or after inoculation not exceeding 10-15 h with benzimidazole was found effective in controlling storage rot caused by ***Penicillium expansum*** and ***Botrytis cinerea*** by various workers (Maas and Mac Swan 1970; Beattie and Outbred 1970; Scott and Roberts 1970; Spalding and Hardenburg 1971).

Effectiveness was higher at 0°C, and this was achieved by relativelly low concetrations of chemicals, while at higher temperatures such as 18-30°C it was

low and higher concetrations were needed. Against *Alternaria* spp., benzimidazoles generally were found ineffective (Spalding 1970), while these was contradictory reports (Ben Arie and Guelfat Reich 1973).

This study was planned to find out the effectivenesses of two benzimidazoles, carbendazim and thiabendazole, imazalil, prochloraz, captan and NaOCl against storage decay of pears caused by important fruit rot agents at 22°C, 0°C and farmers storage conditions.

MATERIALS AND METHODS

In all the experiments artificially inoculated fruits with the most effecient isolates of the commonest storage rot fungi, ***Alternaria tenuissima, Botrytis cinerea*** and ***Penicillum expansum*** were used.

The following fungicides at the given concentration as µg/ml were employed to dip inoculated fruits: Captan 1200, carbendazim 250, imazalil 1000, prochloroz 500, thiabendazole 900 and NaOCl 432.

After surface disinfection and drying at room temperature the fruits were injured by a cork attached with three pins at 2-3 mm depth on two sides, then dipped in fungicide solutions for 1 min, in NaOCl for 10 min. but after inoculation (Cappelini and Stretch 1962; Phillips and Grendahl 1973). After the treated fruits were got dried, 1 ml suspension of 10^5-10^6 spores/ml of the isolates were dropped on the points of injured sides. After re-dried, the fruits were placed in plastic bags and incubated at 0°C, 90 % RH, 22°C and a farmer's storage conditions shown at Figure 1.

Evaluations were made after 5,8 and 11 days at 22°C, 3,5 months at 0°C and 3,5 months at the farmer's store. Treated fruits and controls were counted as diseased and healthy without measuring the size of the rot. The stores were disinfected with, 5 % formalin before the fruits were placed.

RESULTS

Effectiveness of the fungicides against ***Penicillium expansum, Botrytis cinerea*** and ***Alternaria tenuissima*** was given at Table 1, Table 2 and Table 3, respectively.

As seen in Table 1, against ***P. expansum,*** carbendazim had significant effect on the 5 th day, but it was decreased on 11. day to 60 %, The other fungicides did not give a promising result on the 11. day.

Against ***B. cinerea*** (Table 2), Carbendazim occupied the first rank at all the three periods and it was followed by thiabendazole. On the 5 th day, NaOCl acted as carbendazim, but lost its effectiveness on the time increased and it was on the 11 th day. On this last period, thiabendazole, prochloraz and captan and imazalil formed different groups in their effects.

Table 1. Effectiveness of the fungicides against ***Penicillium expansum*** on 5., 8. and 11 days at 22°C.

Fungicides	Averages of replicates+					
	Percent rot			Percent effect		
	5. day	8. day	11. day	5. day	8. day	11. day
Carbendazim	17.5	27.5	40.0	82.5 a	72.5 a	60.0 a
Imazalil	47.5	72.5	85.0	52.5 b	27.5 b	15.0 b
Thiabendazole	50.0	90.0	95.0	50.0 b	10.0 bc	5.0 bc
Prochloraz	52.5	85.0	90.0	47.5 b	15.0 bc	10.0 bc
Captan	90.0	92.5	95.0	10.0 c	7.5 bc	5.0 bc
NaOCl	100.0	100.0	100.0	0.0 d	0.0 c	0.0 c
Control	100.0	100.0	100.0			

+ ($P < 0.01$)

Table 2. Effectiveness of the fungicides against ***Bortrytis cinerea*** on 5., 8. and 11. days at 22°C.

Fungicides	Averages of replicates+					
	Percent rot			Percent effect		
	5. day	8. day	11. day	5. day	8. day	11. day
Carbendazim	17.0	35.0	52.5	85.0 a	65.0 a	47.5 a
Thiabendazole	27.5	60.0	67.5	72.5 ab	40.0 b	40.0 ab
Prochloraz	32.5	82.5	87.5	67.5 ab	17.5 bc	12.5 b
Captan	50.0	92.5	97.5	50.0 b	7.5 cd	2.5 c
Imazalil	85.0	97.5	97.5	15.0 c	2.5 d	2.5 c
NaOCl	15.0	100.0	100.0	85.0 a	0.0 d	0.0 c
Control	100.0	100.0	100.0			

+ ($P < 0.01$)

In case of ***Alternaria tenuissima,*** imazalil was the most effective fungicide (Table 3) on all the three periods, but the effectiveness was not satisfactory when the period was extended. The other fungicides were varying in effect.

Table 3. Effectiveness of the fungicides against ***Alternaria tenuissima*** on 5., 8. and 11 days at 22°C.

Fungicides	Averages of replicates+					
	Percent rot			Percent effect		
	5. day	8. day	11. day	5. day	8. day	11. day
Imazalil	15.0	32.5	45.0	82.21 a	67.5 a	55.0 a
Prochloraz	22.5	47.5	65.0	72.83 ab	52.5 a	35.0 ab
Carbendazim	33.0	77.5	82.5	58.41 ab	22.5 b	17.5 ab
Captan	45.0	80.0	87.5	46.15 bc	20.0 b	12.5 bc
Thiabendazole	70.0	92.5	95.0	16.10 cd	7.5 b	5.0 bc
NaOCl	73.3	89.9	100.0	12.17 d	10.0 b	0.0 c
Control	83.3	100.0	100.0			

+ ($P < 0.01$)

None of the fungicides controlled fruit rot caused by ***Rhizopus stolonifer*** at 22 °C on the given periods. All the inoculated fruits decayed on the 3 rd day after treatment with fungicides.

In the cold storage where inoculated fruits kept 3.5 months at 0°C, ***Alternaria tenuissima*** and ***Rhizopus stolonifer*** did not caused decay so effectiveness of fungicides against these two fungi could not be evaluated.

Table 4. Percent decay and effevtivenesses of the fungicides against ***Penicillium expansum*** kept at 0°C for 3.5 months.

Fungicides	Average of replicates+	
	% decay	% effect
Carbendazim	0.0	100.0 a
Imazalil	0.0	100.0 a
Thiabendazole	0.0	100.0 a
Prochloraz	0.0	100.0 a
NaOCl	90.0	10.0 b
Captan	92.5	7.5 b
Control	100.0	

+ ($P < 0.01$)

Inoculated fruits with ***P. expansum*** and ***B. cinerea*** yielded 100 and 95 percent decay on the controls, respectively.

Efficacy of the fungicides against ***P. expansum*** and ***B. cinerea*** was given at Table 4 and Table 5, respectively.

As it can be seen in Table 4, at 0°C, Carbendazim, imazalil, thiabendazole and prochloraz controlled ***P. expansum*** rot at a very high percentage. Captan and NaOCl on the other hand, found completely ineffective.

Against ***B. cinerea*** (Table 5), a different situation was appeared. Carbendazim with 100 % of efficacy had the first rank and prochloraz, thiabendazole and imazalil formed the second group, captan with slightly lower effect formed the third group and NaOCl with 2.5 % of effect the fourth group.

Table 5. Percent decay and effectivenesses of the fungicides against ***Botrytis cinerea*** kept at 0°C for 3.5 months.

Fungicides	Average of replicates+	
	% decay	% effect
Carbendazim	0.0	100.0 a
Prochloraz	2.5	97.22 ab
Thiabendazole	5.0	94.44 ab
Imazalil	7.5	91.66 ab
Captan	15.5	83.38 b
NaOCl	92.5	2.5 c
Control	95.0	

+ ($P < 0.01$)

Effectiveness of Fungicide Treatment at Farmers Stores.

Effectiveness of fruit dip treatment on the fruits kept at the farmers store of wich conditions were given at Figure 1, against ***P. expansum*** and ***B. cinerea.***

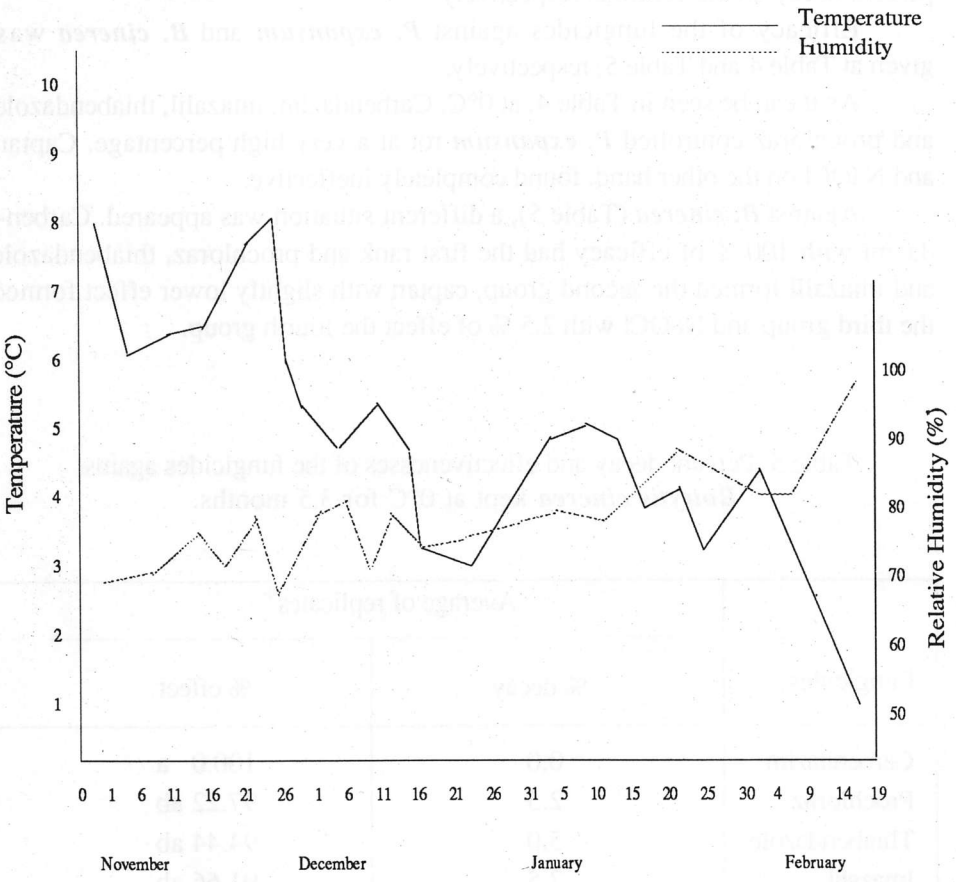

Figure 1. Temperature and relative humidity of the farmers store where the experiments were carried out for 3.5 months.

Percent effects of fungicides against ***P. expansum*** and ***B. cinerea*** were presented at Table 6 and Table 7, respectively.

Against ***P. expansum*** similar results were obtained in farmers' store, however percent effectiveness of the fungicides were slightly lower than 0°C.

Against ***B. cinerea*** the almost same effectiveness of fungicides were obtained (Table 7).

Table 6. Effectiveness of fruit treatment fungicides against ***Penicillium expansum*** after 3.5 months of storage at a farmer store.

Fungicides	Average of replicates+	
	% decay	% effect
Imazalil	2.5	97.5 a
Prochloraz	2.5	97.5 a
Thiabendazole	2.5	97.5 a
Carbendazim	5.0	95.0 a
Captan	92.5	7.5 b
NaOCl	97.5	2.5 b
Control	100.0	

+ ($P < 0.01$)

Table 7. Effect of fruit treatment fungicides against ***Botrytis cinerea*** after 3.5 months of storage at a farmer's store.

Fungicides	Average of replicates+	
	% decay	% effect
Carbendazim	0.0	100.0 a
Prochloraz	2.5	97.5 a
Thiabendazole	5.0	95.0 a
Imazalil	7.5	92.5 a
Captan	64.75	32.25 b
NaOCl	100.0	0.0 c
Control	100.0	

+ ($P < 0.01$)

DISCUSSION

In our study, captan was ineffective in controlling storage rot caused by ***Penicillium expansum*** and ***Botrytis cinerea*** though there had been reports mentioning its effectiveness (Nidubizu and Blanpied 1971; Rosenberger et al., 1979), during 5 months of storage at 0°C.

Regarding with NaOCl, we found the same results as the other authors (Mc Clure, 1958; Spotts and Peters, 1980), it was ineffective against the above mentioned fungi.

At cold storage effectivenesses of the other fungicides on the two fungal rots are very high and this results are in accordance with the other researchers (Rosenberger et al., 1979).

At 22°C, we also found that none of the fungicides tested had prevented fruit deay for a long time. At about this temperature and higher temperatures similar results were reported by other workers (Prusky and Ben-Arie 1981; Spotts 1934; Rosenberger et al., 1984; Tak et al., 1985). In the light of these results it is possible to conclude that at 22°C and higher temperatures it is impossible to keep pears for a long time even if they are treated. On the other hand, at 0°C not only fungicides were effective but temperature itself controlled the decay of some fungi as ***Rhizopus stolonifer*** and ***Alternaria tenuissima.*** However, these two fungi could cause fruit rot at farmers stores, where temperature had been between 0°C - 8°C during storage period (Figure 1).

Four fungicides, carbendazim, thiabendazole, imazalil and prochloraz controlled the most common storage rot agents; ***P. expansum*** and ***B. cinerea,*** at both 0°C and farmers' store. However, we think that at farmers' stores imazalil and prochloraz could be more versatile since ***A. tenuissima*** and ***R. stolonifer*** might cause damage, even though they were not so important such as ***P. expansum*** and ***B. cinerea.***

The importance of treating fruits soon after inoculation has been mentioned by various authors (Cappelini and Stretch, 1962). If it exceeds 18 h, then effectiveness decreases. By taking into consideration this stuation, we recommend that fruits should be treated soon after harvest. If it is not so, treatment would not give positive results.

ÖZET

ARMUTLARDA DEPO ÇÜRÜMELERİNE KARŞI MEYVE İLAÇLAMALARI

Önemli üç depo çürüklük etmenine karşı, altı fungisidin etkinlikleri 22°C, üretici ve soğuk hava deposunda araştırılmıştır. Kullanılan fungisidler, 22°C'de ***Penicillium expansum, Botrytis cinerea*** ve ***Alternaria tenuissima***'ya etkili olmamışlardır. Üretici deposunda ve 0°C'de carbendazim, thiabendazole, prochloraz ve imazalil ***P. expansum,*** ve ***B. cinerea***'ya karşı 3.5 ay süreyle % 90'ın üzerinde etkili bulunmuşlardır.

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