VOLUME : 4 NUMBER : 1 JAN. : 1975

THE JOURNAL OF TURKISH

PHYTOPATHOLOGY

Published by the Turkish Phytopathological Society

TURKISH PHYTOPATHOLOGICAL SOCIETY

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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.

CONTENTS

VOLUME : 4 **NUMBER : 1** **JAN. : 1975**

BİRLİK MATBAASI — 1975

İnönü Caddesi No. 78, Bornova - İZMİR

J. Turkish Phytopath. Vol. : 4 Num. : 1 — 1975

Effects of Alfalfa and Its Rhizosphere on Cotton wilt Fungus, Verticillium dahliae Kleb.

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ABSTRACT

The root extract of alfalfa plant entirely prevented the microsclerotial development of **V. dahliae.** The Leaf and stem extracts affected only the number and size of the microsclerotia. The rhizosphere soil of the plant below 15 cm from surface reduced the percentage of conidial germination of the fungus. On the other hand, a strong antagonistic fungus, **Aspergillus niger,** was obtained from the alfalfa root cuttings.

INTRODUCTION

In 1951, Wilhelm reported that some soil amendments such as blood meal, fish meal and cottonseed meal, reduced the inoculum potential of **Verticillium** fungus in pot soil (6). Soil amended by adding oatmeal or alfalfa meal also affected the **Verticillium** wilt (5). GILBERT et al (2) experimentally showed that, when soil was exposed to the volatile substances from alfalfa hay for a period of 24 hrs, the pathogen was eliminated for 12 weeks.

Crop rotation also reduced the cotton wilt. For instance, when alfalfa, maize, wheat, barley and oat plants were used in rotation the soil became less favourable for **V. dahliae** (1,4).

Germination of microsclerotia were reduced three or four times when the soil amended by adding sawdust, wheat straw and cotton seed husks (1). YUNUSOV observed that cotton wilt could be entirely prevented when crop-rotation was applied as 2-years alfalfa or 1-year alfalfa and 1-year maize (7).

In this paper, the results of investigations on the effects of different parts of the alfalfa plants and its rhizosphere soil on the mycelial and microsclerotial development and on the germination of conidia of **V. dahliae** will be discussed.

MATERIALS and METHODS

Alfalfa Samples : The Peruvian alfalfa **(Medicago sativa L.)** was used in this work. The three year old plants were uprooted from the trial plots of Agricultural Faculty. The plants were washed under tap-water.

Soil Samples : From the rhizosphere of the plants, three soil samples were taken. Samples were from the four different depths: 0-5 cm, 5-10 cm, 10-15 cm. and 15-20 cm. The three soil samples taken from each depth were mixed, sieved by 2 mm sieve, and air-dried for 12 hrs.

Culture of V. dahliae : Isolate of Salihli -1 of **Verticillium dahliae** Kleb was used in all the tests. It was highly virulent cotton wilt isolate. The pathogen was cultured on PDA (200 g potatoes, 20 g dextrose, 17 g agar) for 10 days and used for the tests.

Effect of Alfalfa on Microsclerotial and Mycelial Development of V. dahliae : The roots of alfalfa were cut into parts in 2 mm thickness, and surface disinfected by 0,1 % $HgCl_2$ for 1 min. then washed in sterilized water. At least 8 cuttings were placed into each Petri dish including 20 ml of PDA. To the centre of each of these petri dishes a mycelial part of **V. dahliae** planted and incubated in 22°C.

Roots, stems and leaves of alfalfa were ground and extracted in sterile - distilled water for 24 hrs, and filtrated by ten-fold chesecloth. This filtrate was used instead of water in preparing P.D.A. medium. Then the medium was autoclaved at 120°C for 15 min. The Petri dishes with normal PDA medium were used as check of the treatment. After incubating for a period in these dishes, growth of the colony and production of microsclerotia of **V. dahliae** were observed.

Effect of Alfalfa Rhizosphere Soil on the Germination of Conidia of V. dahliae : The percentages of the conidia were estimated by Agar-Disc Technique (3) using the sieved and air-dried soil of alfalfa rhizosphere. Cotton field soil was used as check of the treatment. In this test, for each Petri dish 40 g of the soil was weighed and its humidity was adjusted to 60 % of the water holding capacity. Then the each of all the agar-discs were inoculated by one drop of well homogenized conidial suspension using 1-ml of pippet.

After inoculation, the dishes incubated at 22°C for 16 hrs. Germinated and ungerminated conidia were recorded.

RESULTS and DISCUSSION

Effect of Alfalfa on Microsclerotial and Mycelial Development of V. dahliae : When the root cuttings of alfalfa incubated for a period of one week, it was observed that there was no growth of **V. dahliae** which had been previously planted on the centre of each dish. Although the all cuttings were surface-disinfected by 0,1 % $HgCl_2$ for one minute, **Aspergillus niger** developed from the 50,4 % of planted root cuttings (Figure 1).

Table 1 summarizes the results obtained from 7-14 day old colonies of **V. dahliae** which developed on the media prepared by using the extracts of root, stem and leaf of alfalfa.

According to Table 1, there is no difference between the colony diameters on PDA and on the extracts of alfalfa. So it may be expressed that extracts of alfalfa have no effect on mycelial growth of **V. dahliae** (Figure 2). But, there was no microsclerotial development on the root extract of alfalfa. In the extracts of leaf and stem, the fungus produced

Table 1. Diameters of colonies and the Numbers of Microsclerotia of **V. dahliae** on alfalfa extracts

Media	Diameter of colony*		The average number of microsclerotia on 14th day**
	7th day (mm)	14th day (mm)	
Root Extract with PDA	26.8	51.4	0
Leaf Extract with PDA	21.5	45.5	22.3
Stem Extract with PDA	19.7	42.0	56.3
Check (PDA)	245	53.0	164.0

* Average of 5 petri dishes

** Average of the numbers of 5 petri dishes with 3 replications for each dish under microscope, magnification x 450.

Table 2. Germination of conidia of **V. dahliae** on the Rhizosphere soil of Alfalfa*

Depth of the soil (cm)	Germination of Conidia (%)
0- 5	38,8
5-10	39,6
10-15	33,1
15-20	65,8
Check (PDA)	52,4

* Average of 5 petri dishess with 3 replications for each disc and four discs for each dish.

microsclerotia, in the ratio of 1/8 and 1/3 of PDA, in respectively.

Alfalfa affects the microsclerotial development both quantitatively and qualitatively. The microsclerotia developed on alfalfa extracts were smaller than that of developed on P.D.A. (Figure 3).

Table 2 shows the data of conidia tests on the alfalfa rhizosphere soil.

It is clear that soil of 0-15 cm depth of the alfalfa rhizosphere reduces the pencentage of conidial germination.

It can be concluded that, **A. niger** from the root mycoflora of alfalfa entirely prevents the development of **V. dahliae.** But among the parts of the alfalfa plant only chemical composition of root showed an exact antagonism against the development of microsclerotia. On the other hand, extracts of leaf and stem of alfalfa were less effective against the microsclerotial development of the pathogen in compare with the root extract. It appears that this effect is due to a thermostable or a gaseous matter which was found mostly in the root tissue of alfalfa.

It is very meaningful that only **A. niger** developed from the surface-disinfected root cuttings. Indeed, KOSTENKO and NESTEROV reported that when crop rotation such as 3 years alfalfa and 1-year maize is applied the soil becomes very favourable for the antagonistic microorganisms of **V. dahliae** (4). It should be clarified that **A. niger** is the most important antagonistic organism of **V. dahliae.**

BENKEN et al. (1) observed that cottonseed husks and sawdust

prevented the development of microsclerotia. By this investigation, it has been understood that alfalfa has also an effect of this type.

It will be very interesting to investigate all these effects of alfalfa in pots and in field plots in respect to control of **Verticillium** wilt of cotton.

ÖZET

YONCA BİTKİSİNİN ÇEŞİTLİ KISIMLARININ ve RİZOSFER TOPRAĞININ SOLGUNLUK ETMENİ **Verticillium dahliae** FUNGUSU ÜZERİNE ETKİLERİ

Yonca bitkisinin kök, sap ve yaprak ekstraktının ve ayrıca yonca rizosferinden alınan toprağın pamuk solgunluk etmeni olan **V. dahliae** üzerine olan etkisi laboratuvar koşullarında araştırıldı.

Kök ekstraktı ile hazırlanan ortamlarda **V. dahliae**'nın mikrosikleroti oluşumunun kesin olarak önlendiği anlaşılmıştır. Ayrıca yaprak ve sap ekstraktlarının da mikrosikleroti oluşumunu azaltıcı etkisi bulunduğu görülmüştür.

Yonca kök kesitlerinin ekildiği petrilerde **V. dahliae** kesin olarak kolonize olamamıştır. Buna karşılık dıştan sterilize edilmiş olan bu kesitlerden çok sayıda **Aspergillus niger** gelişmiştir.

Yonca rizosferinin, 0-5, 5-10, 10-15, 15-20 cm. derinliklerinden alınan topraklarda **V. dahliae** conidiumlarının çimlenmesi toprak yüzüne doğru bir gerileme göstermiştir.

Çalışmalar yoncadan izole edilen **A. niger**'in **V. dahliae**'ye antagonismi üzerinde ve aynı zamanda yonca köklerinin uygulamada pamuk **V. dahliae** solgunluğunu önlemede nasıl kullanılacağı yönünde geliştirilmelidir.

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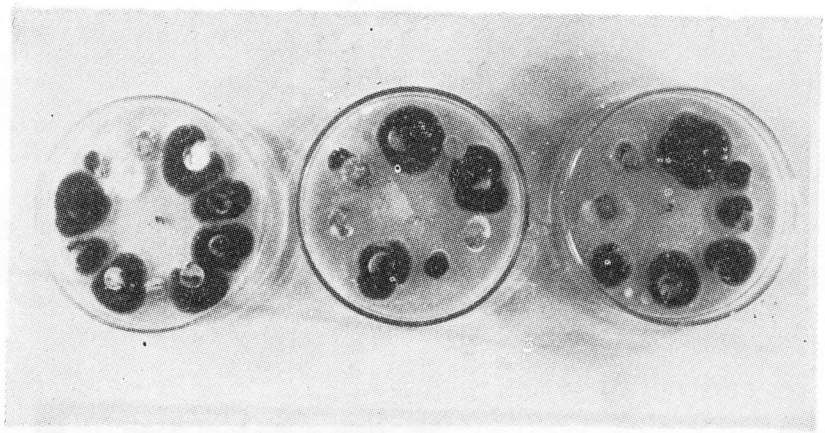

Figure 1. Colonies of **A. niger** developed from alfalfa root cuttings and their antagonistic effect on **V. dahliae** planted to the centre of each dish.

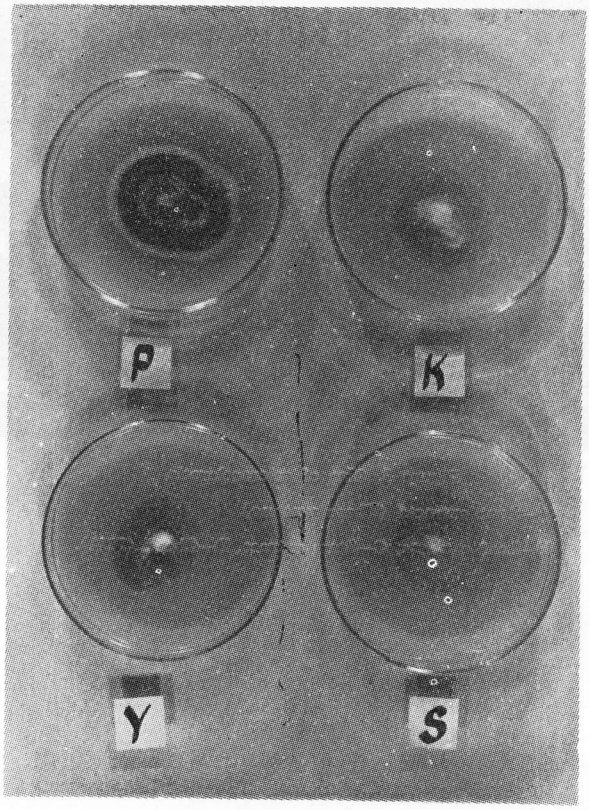

Figure 2. Colonies of **V. dahliae** on PDA (P), root extract (K), leaf extract (Y), stem extract (S) of alfalfa.

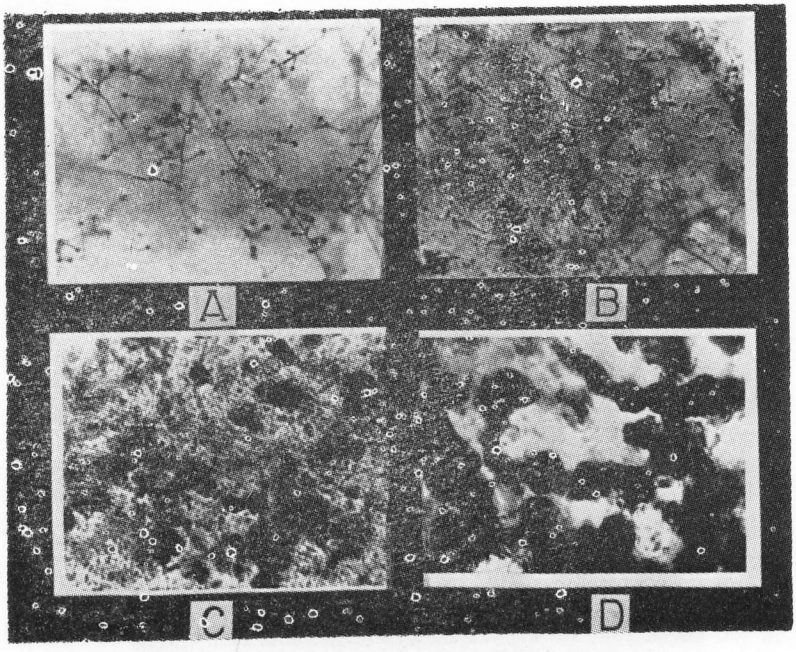

Figure 3. Size of microsclerotia

A—Root extracts (There was no)

B—Leaf extracts, C—Stem extract, D—Check (PDA).

J. Turkish Phytopath. Vol. : 4 Num. : 1 — 1975

Investigations on the Determination and Pathogenicity of the Fungal Flora of Fruit Nursery Soils in Izmir.

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ABSTRACT

This study has been done in order to determine, the mycoflora and the pathogenicity of some of the important isolated fungi, in the fruit nursery soils of the province İzmir .

Studies were carried-out between 1970-1973 and 34 genera of fungi were isolated. The genera such as **Alternaria, Fusarium, Phoma, Pythium, Sclerotium** and **Verticillium** were tested for the determination of their pathogenicity on peach, apricot, almond, apple, olive and citrus seedlings. All the genera tested, retarted the root growth of the test plants. It was determined that, the tested pathogens were combined with some of the saprophytic genera such as, **Aspergillus, Penicillium, Gliocladium, Myrothecium, Stachybotrys** and **Trichoderma** and the rate of decline in root growth was larger than the pathogens' effect alone.

INTRODUCTION

Fruit crops have a great importance in Turkish agriculture and Aegean Region is a very important fruit growing area in Turkey. According to 1969 statistics, total number of fruit tees in this region is 72.120.000 with olives taking the first place and followed by figs, citrus and peaches. Aegean Region is also a very important export center. The export value of the fruits in 1970-1971 season (exclu-

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ding raisins) was 237.899.328 TL . and it was raised to 250.009.562 TL. in 1971-1972. The fruits were exported as fresh product, dried fruit, pulp, seeds and oil.

It is believed that for a sound development in fruit growing, the use of healty and high quality planting material is essential. Similar to the developments in orchard areas, fruit tree nurseries are also in a rapid growth. In the last five years, there has been a rapid increase in the number of fruit tree nurseries in the region.

Although it is not noticeable in Turkey yet, in some other countries, through infested nursery stock various fungal pathogens have spread around the country. According to Zentmyer et.al. (1952) and Mc Intosh (1969) respectively, extensive presence of **P. cinnomomi** in citrus orchards and **P. cactorum** in apple orchards are due to usage of infested planting stock as starting material.

Several researchers have concluded that replanting old peach orchards (Hine, 1961; Micretich and Keil, 1970) and citrus orchards (Martin, 1951; Carpenter and Furr, 1962) causes disease problems. These researchers all agree that this is because of pathogenic fungal complexes formed in the soil inhabiting **Pythium** spp., **Phytophytora** spp. **Fusarium** spp. **Rhizoctonia** spp., and some other soil microorganisms. So far, no research was performed on mycoflora of soil inhabiting fungi and pathogenicity of some important ones in Turkey. Present study was carried out at Bornova Regional Plant Protection Research Institute through 1971-1973. The main purpose of our research was to determine the soil mycoflora of fruit nursery soils and pathogenicity of some of the isolated fungi. The relationship between physical properties of the soil and fungal population inhabiting it, was also studied.

MATERIAL and METHODS

Soil samples were collected from the fruit nurseries of all counties in İzmir province, according to Meredith's technique of sampling (Meredith, 1940). Physical analysis of the soil samples were also performed. Soil plate technique was applied in isolations from the rhizosphere (Warcup, 1950). Rose bengal and streptomycin added Czapec and Carrot agar were the isolation mediums.

Pathogenicity trials were performed in pots on 1,5-2 months old peach, almond, apricot, apple, olive and trifoliate orange seedlings. Genera of **Alternaria, Fusarium, Phoma, Pythium, Sclerotium** and **Verticillium** were tested for pathogenicity. These genera were both app-

lied singly and in mixture with saprophytic fungi like **Myrothecium, Gliocladium, Trichoderma, Stachybotrys, Aspergillus** and **Penicillium.** Test plants were dipped into inoculum as previously described by Wiles (1952) and results were obtained two months after inoculation by measuring the differences in the root growth of the seedlings according to the following scale :

0-Normal root development

1-Mild decline in root growth

2-Medium amount of decline in root growth

3-Serious decline in root growth

4-Extreme decline in root growth

Figure 1 illustrates various degrees of decline on apple seedlings between 0-4 on the scale.

The decline rates were calculated from the scale readings by utilizing Towsend-Heuberger formula. Differences between the characters were established by analysis of variance and orthogonal comparison.

RESULTS and DISCUSSION

A — Isolated genera and their rates of presence.

Table 1 summarizes the results of survey studies in İzmir fruit tree nursery soils. Relative intensity of each genus, in the soil samples was calculated as a percent ratio of number of its isolates over total number of isolates recovered. Rates of presence in sampled fruit tree nurseries are also given.

Working with a total of 1124 isolates we recovered 34 genera of fungi (including mycelia sterilia) in soil samples. Most commonly isolated fungi were **Fusarium** which took the first place, followed by **Aspergillus, Mucor, Myrothecium** and **Trichoderma.** Our studies completely agree with the reports by several investigators including Warcup (1951), Thrower (1955), Durrell and Shield (1960). **Podospora platensis** (Speg) Niessl., **Cladorrhinum foecondissimum** Sacc. and March., **Dreschlera bromi** (Died.) Drechsl. and **Stachybotrys bisbyi** (Srinivasan) Barron were determined first time in Turkish mycoflora. The genera **Podospora** and **Cladorrhinum** were not recorded in Turkey previously.

B-The relationship of isolated fungi with the physical properties of the soil.

Physical analysis of nursery soils indicated that pH ranged between 0,0-5,4, percent saturation was 0-70, permeability ranges were 0,5-25 and salt content was between 0-8 degrees. No correlation detected between types of soil and genera of fungi inhabiting it. Certain genera were isolated from diffe-

Table 1. Isolated genera and their rates of presence in total number of isolates and sampled fruit tree nurseries.

Name	No. of recovered isolates	Relative Intensity (%)	Rates of presence in the nurseries (%)
Fusarium	245	21,79	100
Aspergillus	167	14,85	90,6
Mucor	141	12,54	83,7
Myrothecium	79	7,02	74,4
Trichoderma	75	6,67	76,7
Rhizopus	65	5,78	83,7
Stachybotrys	61	5,42	53,4
Pythium	53	4,71	55,8
Penicillium	41	3,64	51,1
Gliocladium	24	2,14	32,5
Sclerotium	23	2,04	23,2
Humicola	21	1,86	25,5
Helminthosporium	20	1,77	25,5
Actinomucor	14	1,24	23,2
Botryotrichum	11	0,97	23,2
Cephalosporium	10	0,88	16,2
Papulospora	9	0,80	16,2
Alternaria	8	0,71	9,3
Chaetomium	8	0,71	9,3
Steril	8	0,71	9,3
Verticillium	7	0,62	18,6
Thielavia	7	0,62	11,6
Ulocladium	6	0,53	9,3
Paecilomyces	5	0,44	9,3
Cylindrocarpon	3	0,26	6,9
Trichothecium	3	0,26	6,9
Curvularia	2	0,17	2,3
Cladorrhinum	2	0,17	4,6
Drechslera	1	0,08	2,3
Scopulariopsis	1	0,08	2,3
Phoma	1	0,08	2,3
Podospora	1	0,08	2,3
Sordaria	1	0,08	2,3
Nigrospora	1	0,08	2,3

rent soil types. These results correspond with Al-Doory (1959), Kaufman and Williams (1964) and Eicker (1969) who report that there is no correlation between physical properties of the soil and its fungal population.

C-Pathogenicity trials

In pathogenicity trials, genera of **Alternaria, Fusarium, Phoma, Pythium, Sclerotium** and **Verticillium** caused various degrees of root decline, however no detectable effect was observed on above soil parts of the plants. Results of previous studies by Hine (1962) and Sonderhousen (1971) on peach and cherry seedlings also demonstrate pathogenic fungi slow down the growth rate and caused decline in root growth. According to our experiments, when pathogens were mixed with saprophytes, decline rate in root growth was larger than their effect alone. Decline rates of test seedlings upon inoculation with various genera are given in Figures 2, 3 and 4.

Figures 5 and 6 illustrate some examples of the effect pathogenic fungi alone and when they were applied with the saprophytes.

Although various test plants responded certain pathogenic fungi similarly, their effect on trifoliate orange was less severe. This may be due to the fact that trifoliate orange is more resistant to nematodes and soil fungi than the other rootstocks (Baines et. al. 1962).

Various reports indicate that the saprophytic fungi which were applied with the pathogenic genera in this study, have antagonistic effect on many plant pathogenic fungi (Wilson 1955; Catani and Peterson 1963). However, antagonism in the soil can only take place when soil pH, temperature, humidity, organic matter content, inoculum potential of the antagonistic organism and its ability to inhabit soil are appropriate for this type of interaction (Waksman 1952; Sanford 1959; Hepting 1963). Previous reports indicate that it is not unusual to obtain enhanced reaction rates as it was observed in our studies, when certain saprophytes are added with the pathogens. In such cases saprophytic fungi may help penetration of pathogen by increasing sensitivity of the host through certain biochemical activities, on the contrary, pathogenic fungi may form points on entrance for the saprophytes, further weaking the host by their combined effect. Another explanation for the increased root decline in the host would be that some of the fungi called saprophytes, may actually be pathogenic under certain circumstances.

In conclusion, we might say that there are many aspects of soil

host-pathogen interactions and their relationship with the soil microflora, which are not clear to us yet and these subjects will continue to be a challenging field of research for a long time.

ÖZET

İZMİR İLİ MEYVE FİDANLIKLARI TOPRAKLARINDA FUNGAL FLORANIN TESBİTİ VE ÖNEMLİLERİNİN PATOJENİSİTELERİ ÜZERİNDE ARAŞTIRMALAR

Bu çalışma İzmir ili meyve fidanlıkları topraklarının mikoflorasını ve izole edilen funguslardan önemlilerinin patojenisitelerini saptamak amacıyla yapılmıştır. 1971-1973 yıllarında Bornova Bölge Zirai Mücadele Araş. Ens.de yürütülen çalışma sonunda, sürvey alanından 34 fungus genusu izole edilmiştir. Bunlardan **Podospora** ve **Cladorrhinum** genusları **ile Drechslera bromi** (Died) Drechsl. ve **Stachybotrys bisbyi** (Srinivasan) Barron türleri Türkiye için yenidir. Çalışmalar sırasında izole edilen fungusların toprağın fiziksel özelliklerine bağlı olarak bir dağılım göstermedikleri, ayni genusların, değişik fiziksel nitelikteki topraklarda bulunabildiği saptanmıştır. Patojenisite testleri sonunda, patojenisitesi aranan **Alternaria, Fusarium, Phoma, Pyhium, Sclerotium** ve **Verticillium** genusları arasında bir farklılık bulunmamıştır. Tüm genuslar test bitkisi olarak kullanılan, şeftali, badem, kayısı, elma, zeytin ve üç yapraklı çöğürlerinin toprak üstü kısımlarında herhangibir simptom vermeyip, kök gelişmesinin gerilemesine neden olmuşlardır. **Aspergillus, Penicillium, Gliocladium, Myrothecium, Stachybotrys** ve **Trichoderma** gibi çalışmalar sırasında izole edilen saprofit genuslarla birarada verildiklerinde ise, patojenlerin kök gelişimini geriletici etkilerinin arttığı saptanmıştır.

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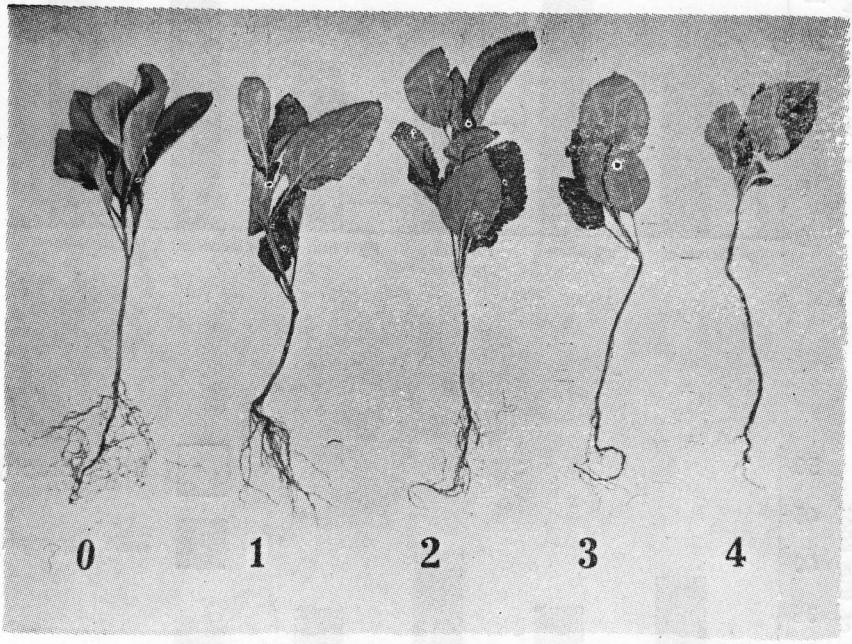

Fig. 1. Apple seedlings showing various degrees of root decline classified between 0-4 according to the scale used.

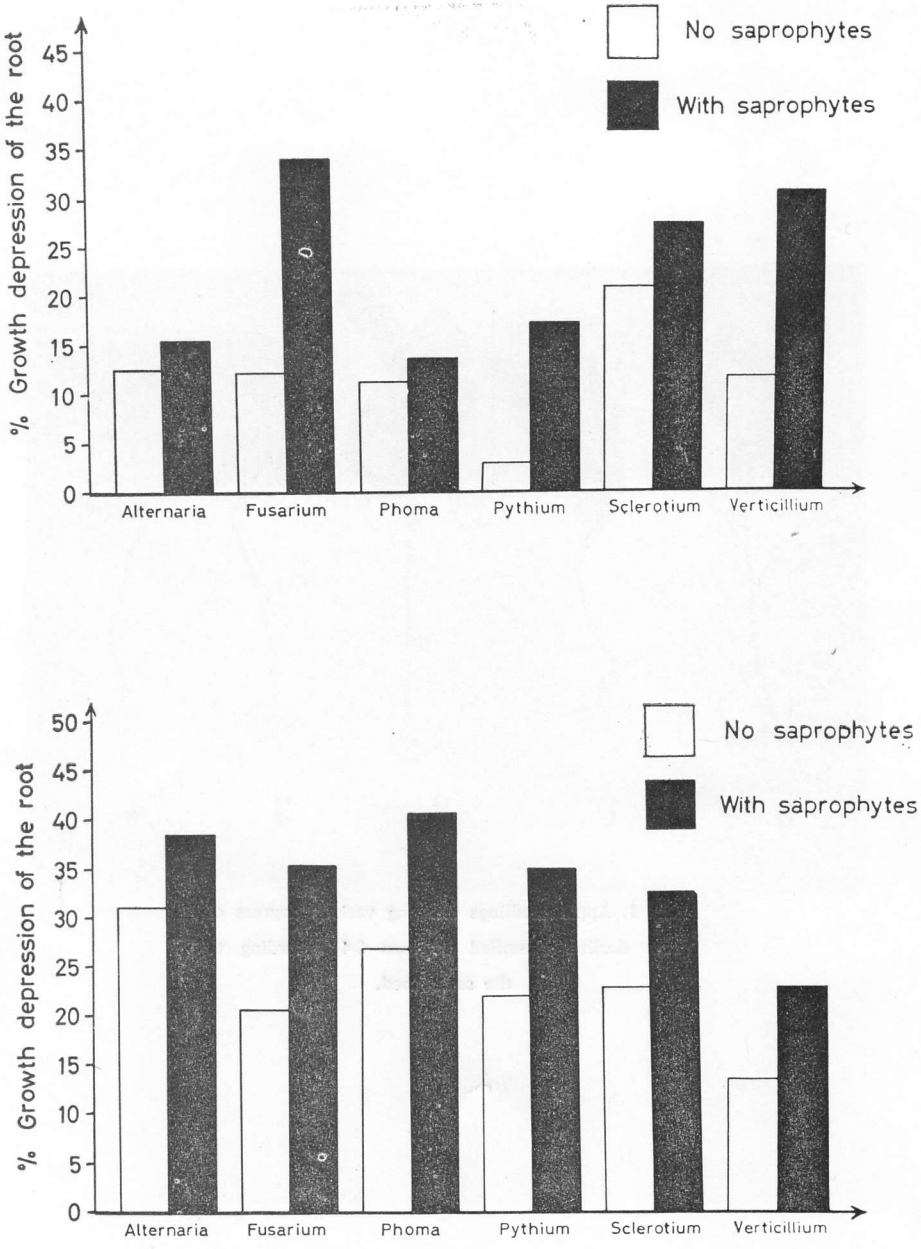

Fig. 2. Decline rates of root growth in apple (above) and peach (below) seedlings.

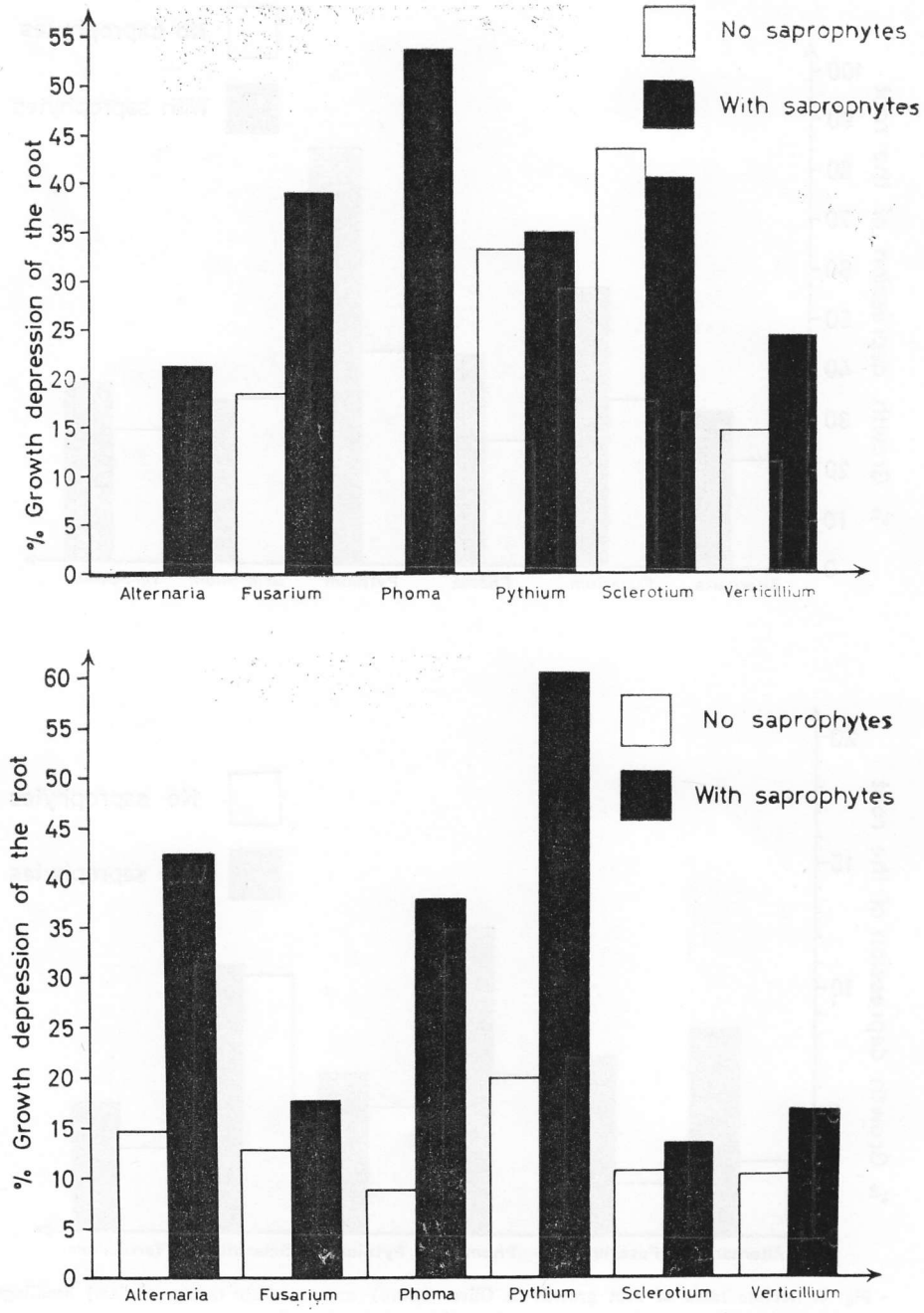

Fig. 3. Decline rates of root growth in almond (above) and apricot (below) seedlings.

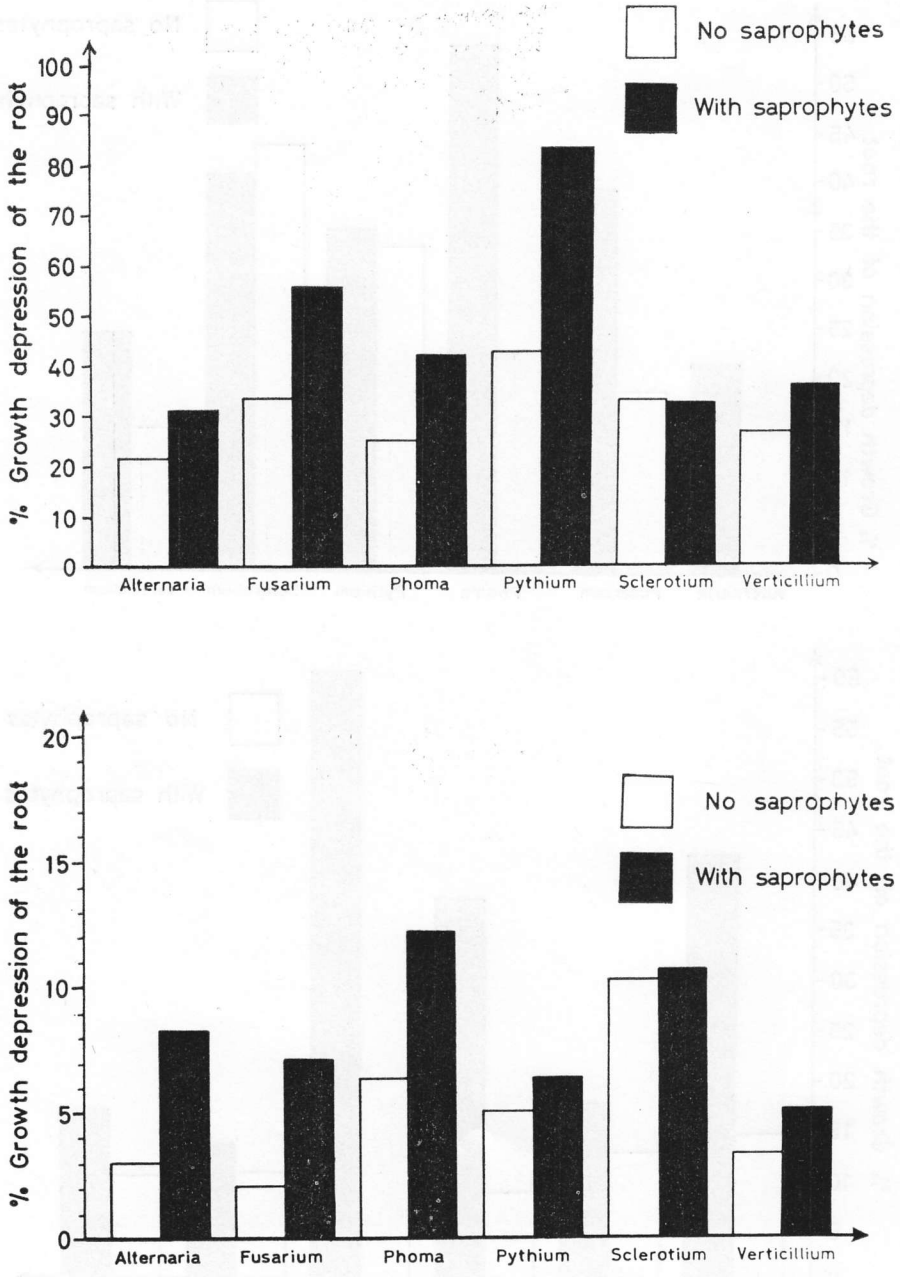

Fig. 4. Decline rates of root growth in Olive (above) and trifoliate orange (below) seedlings.

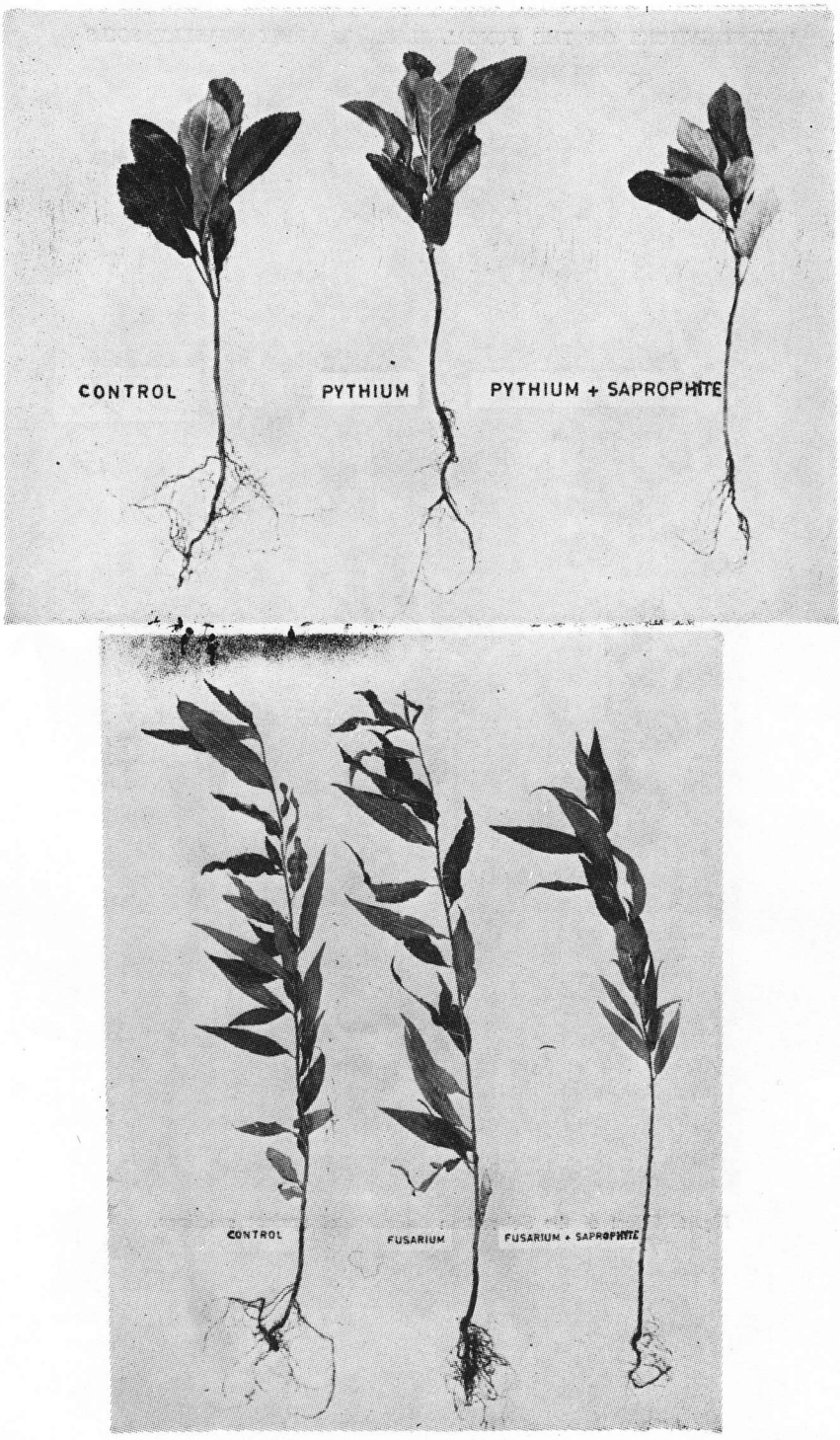

Fig. 5. Effect of the genera **Pythium** and **Fusarium** on roots of apple and peach seedlings respectively.

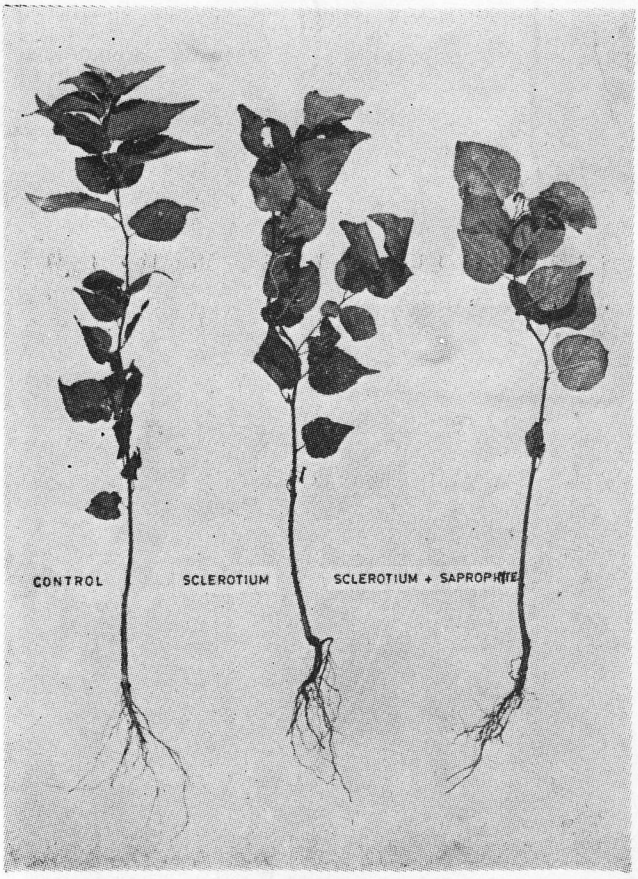

Fig. 6. Effect of the **Sclerotium** on roots of apricot seedlings.

J. Turkish Phytopath. Vol. : 4 Num. : 1 — 1975

An Investigation on Rice Seed-borne Fungi in Ege Region

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ABSTRACT

Seed-borne fungi of rice were investigated on 54 samples which were collected from growers in the Ege Region in 1973 and 1974.

Pyricularia oryzae, one of the most important fungus of rice, and some other fungi such as **Curcularia spp., Drechslera spp., Fusarium spp., Nigrospora oryzae** etc. were detected.

INTRODUCTION

Seed-borne diseases are very important in different point of view like as to grow healty plants, to use or not fungicides or other chemicals, healtf of human beings, storage, symbionizm, biological control and agricultural quarantine (16).

In Turkey, first time seed-borne cereal diseases were investigated in Central Region (7). Later seed-borne diseases of vegetable were studied in Marmara Region (14).

There are also some investigatoins about rice diseases in Turkey. There are 3 **Helminthosporium** species cause brown spot on rice, which are **H. oryzae** Breda de Haan (isolated from Tarsus, Silifke and Akçakoca), **H. rostratum** Drechsl. (isolated from Antalya) and **H. halodes** Drechsl. (isolated from Manyas) (9).

Pyricularia oryzae is common on rice in Mediterranean, Black Sea, Central and South-east Regions of Turkey. This fungus caused 8,33 % crop loss in Diyarbakır in 1963 and 1939. Also this fungus is transmitted by infected seeds from year to year, not by other host plants and rice stubble in this Region (12).

Table 1. Percent of different fungi recorded in rice seed samples in first year (%).

	DENİZLİ		İZMİR			MANİSA		
	Çivril	Sarayköy	Foça	Menemen	Merkez	Saruhanlı	Soma	Turgutlu
Acromoniella sp.	—	—	1,37	—	—	—	—	—
Alternaria tenuis	26,37	53,50	94,25	23,10	17,62	41,62	41,50	84,40
Aspergillus spp.	0,75	0,75	3,62	1,17	0,37	2,37	1,00	0,50
Cephalosporium sp.	—	0,25	—	—	—	2,25	1,50	3,50
Chaetomium sp.	—	—	—	0,10	0,12	0,12	0,50	—
Cladosporium spp.	6,87	1,25	0,87	0,75	2,50	0,37	—	9,50
Curvularia geniculata	—	—	—	—	—	—	—	0,50
« inaequalis	—	—	—	—	—	—	—	0,50
« lunata	—	—	—	0,07	—	—	—	—
Drechslera graminea	—	—	—	0,03	—	—	—	—
« sorokiniana	0,25	6,75	—	1,00	—	—	0,25	3,50
« tetramera	4,00	0,25	3,50	1,96	0,50	1,75	0,25	41,00
Epicoccum sp.	—	12,75	—	3,75	—	—	—	17,00
Fusarium acuminatum	—	—	—	0,03	—	—	—	—
« concolar	—	—	0,25	—	—	—	—	—
« culmorum	—	—	0,50	—	—	—	—	0,50
« equiseti	0,25	0,75	0,50	—	—	0,25	—	2,00
« lateritium	—	—	—	0,07	—	—	—	—
« moniliforme	—	—	11,87	—	0,12	3,87	0,25	26,50
« nivale	—	—	—	—	—	0,50	—	—
« oxysporum	—	—	—	0,17	0,12	—	—	0,50
« sambucinum	—	—	0,50	0,07	0,12	1,37	0,75	2,50
« semitectum	—	2,25	3,12	0,64	—	3,25	1,75	4,50
« solani	0,12	—	0,25	0,25	—	0,12	—	1,00
Fusidium sp.	—	—	—	0,03	—	—	—	—
Gliocladium sp.	—	—	—	—	—	0,37	—	—
Graphium sp.	—	—	—	—	—	0,12	—	—
Hyaloflorae sp.	—	—	0,12	0,03	—	1,00	—	—
Nigrospora oryzae	0,12	2,25	19,75	0,10	38,87	—	—	16,50
Papularia sp.	—	1,50	0,62	0,39	0,37	—	—	0,50
Penicillium spp.	8,25	—	8,87	9,53	7,37	11,75	13,50	2,50
Phoma sp.	0,62	2,0	—	1,07	—	0,62	—	1,00
Pyricularia oryzae	—	4,0	—	—	—	—	—	0,50
Stachybotrys sp.	0,25	1,0	0,37	1,10	—	0,12	—	—
Stemphylium sp.	—	—	0,12	0,21	0,12	—	0,25	3,00
Trichothecium sp.	0,12	0,5	37,12	0,03	0,12	10,50	0,75	21,00
Ulocladium sp.	7,37	—	1,75	1,64	7,00	27,25	—	7,50
Verticillium sp.	—	—	—	—	—	0,25	—	—
Germination	88,75	89,25	87,12	89,39	24,12	48,25	74,50	93,35

Table 2. (Continued) Percent of different fungi recorded in rice seed samples in second year (%).

	AYDIN	DENİZLİ		İZMİR		MANİSA	
	Söke	Çivril	Sarayköy	Foça	Menemen	Merkez	Turgutlu
Acromoniella sp.	—	—	—	1,87	—	0,20	0,30
Alternaria tenuis	99,25	1,25	78,59	93,75	85,05	99,80	92,20
Aspergillus spp.	12,5	4,50	14,50	0,37	2,50	1,60	1,65
Cephalosporium sp.	0,75	—	1,00	7,87	8,42	1,55	4,05
Chaetomium sp.	1,00	0,50	—	—	0,02	—	—
Cladosporium spp.	4,67	—	1,91	76,25	31,72	64,00	20,35
Curvularia geniculata	—	—	—	0,25	—	—	—
« inaequalis	0,50	—	1,83	—	—	—	0,05
« lunata	—	—	0,66	—	0,05	—	0,02
Drechslera cynodontis	—	—	—	—	—	—	0,02
« dematioides	—	—	—	—	0,02	—	—
« hawainensis	—	—	—	—	0,05	—	—
« sorokiniana	—	—	0,16	0,25	0,52	0,05	0,07
« tetramera	5,00	0,25	8,08	1,00	1,57	3,65	7,45
« spp.	—	—	0,08	—	0,02	0,40	—
Epicoccum sp.	4,25	—	0,08	6,25	3,95	3,50	4,00
Fusarium acuminatum	—	—	—	—	—	—	0,05
« equiseti	0,25	—	0,08	1,00	0,75	0,05	0,20
« lateritium	—	—	—	—	0,05	—	—
« moniliforme	2,75	1,75	5,58	2,25	4,01	0,65	0,57
« sambunicum	—	0,25	—	0,50	0,17	0,05	0,17
« semitectum	1,50	—	1,66	4,12	8,15	0,35	0,52
« solani	—	—	0,08	—	0,07	—	—
« sp.	—	—	0,25	—	0,05	—	0,05
Fusidium sp.	—	—	0,25	0,12	0,02	—	—
Gonatobotrys sp.	—	—	—	—	0,15	—	—
Hyaloflorae sp.	0,25	—	—	0,12	—	—	—
Melanospora sp.	—	—	—	—	0,10	—	—
Myrothecium sp.	—	—	0,08	—	0,02	—	—
Nigrospora sp.	1,25	—	1,08	0,87	4,75	0,01	4,67
Papularia sp.	—	—	—	1,25	0,75	—	0,10

Penicillium spp.	13,50	99,00	7,91	0,37	2,72	0,60	1,20
Phoma sp.	0,25	—	0,08	—	0,10	0,25	0,10
Pyriculeria sp.	—	—	—	—	—	—	0,02
Sclerotium sp.	—	—	—	—	0,12	—	0,02
Sepedonium sp.	—	—	—	—	0,22	—	—
Septonema sp.	—	—	—	—	—	—	0,02
Stachybotrys sp.	0,25	—	1,66	—	0,25	0,25	0,32
Stemphylium sp.	0,50	—	—	2,50	2,00	0,05	0,40
Trichothecium sp.	1,00	2,25	13,00	51,37	37,97	11,00	16,80
Ulocladium sp.	1,75	2,00	2,91	0,62	0,72	0,65	0,70
Verticillium lateritium	—	—	—	—	0,02	—	—
« sp.	—	—	—	—	0,02	—	—
Germination	74,50	61,25	89,91	58,12	61,55	85,15	85,65

Recently, Seed-borne fungi of vegetables in Ege Region were detected by using international method (bloter method) (16).

MATERIALS and METHODS

Seed samples of rice were collected from the village growers in Ege Region in 1973 and 1974. These villages belong to different cities like as Aydın, Denizli, İzmir and Manisa. First year 22 samples and second year 32 samples were collected. The names of the rice varieties are Bersani, ribe, maratelli, carolin, TNT and acem.

Blotter method was used to detect seed-borne fungi. Four hundred seeds of each sample were placed on three layers of blotter moistened in water, at the rate of 25 seeds per petri dishes and incubated in 20-23 C° under alternating cycles of 12 hours light and 12 hours darkness. After 8 days every seed was axamined under a stereomicrosope at 50x magnification for the presence of seed-borne fungi (8), and certain keys were used for identification (1, 2, 3, 4, 5, 6, 10, 13).

RESULTS and DISCUSSION

Seed-borne fungi of rice are presented in Tables 1 and 2. As there are shown tables, **Pyricularia oryzae** which causes one of the most important rice diseases was found a small amount in some localities. Some other fungi are not as much important as **Pyricularia oryzae**, can cause qualitative damage of rice kernels and glumes such as **Alternaria tenuis, Curvularia** sp., **Epicoccum** spp., etc.

ÖZET

EGE BÖLGESİ ÇELTİKLERİNDE TOHUM ORİJİNLİ FUNGUSLAR ÜZERİNDE BİR ARAŞTIRMA

Ege bölgesinde yetiştirilen çeltiklerde tohumla geçen fungal etmenlerin tesbiti için, tohum örnekleri, Aydın, Denizli, İzmir ve Manisaya bağlı köylerden 1973 ve 1974 yıllarında toplanmıştır. Bu örneklere I.S.T.A. nın (International Seed Testing Association) önerdiği nemli hücre metodu (blotter method) uygulanmıştır. Teşhis edilen funguslar cetvel 1 ve 2 de görülmektedir.

Çeltiklerde önemli hastalık yapan 3 etmenden biri olan **Pyricularia oryzae** bazı lokasyonlarda az miktarda bulunmuştur.

Diğer parazit, zayıf parazit veya saprofit olan bazı funguslar da danede kalitatif zarar yaparlar.

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J. Turkish Phytopath. Vol. : 4 Num. : 1 — 1975

Studies on the Chemical Control of Common Bunt (Tilletia foetida "wall" Liro) of wheat

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ABSTRACT

According to the results obtained in previous studies, some chemicals such as Ceresan UT 687, Hekmazin, Dithane M-45 W.P., and Trimangol 80 are widely used as a seed treatment at 0.15 % level instead of 0.2 % against the common bunt of wheat.

In this study effectiveness of the chemicals at various dosages were examined in order to determine the effect at 0.1 % level.

The results showed that the all chemicals except Hekmazin were effective at 0.1 % level as well as at 0.15 %. But it is necessary to improve the equipment of seed treatment or establish new formulations of the chemicals before recommendation at this dosage.

INTRODUCTION

The bunt disease of Wheat is one of the important disease of wheat in Turkey and it is prevalent throughout the country (2). The large part of wheat seeds are treated by using some of organic mercurial and non-mercurial products were found effective previously in Turkey (3). As a rule the seed treatment is known as a cheap method, but a seed treatment should be effective enough, economical, chemically stable and easy to apply. The reduction of the cost of seed treatment depend on the dosages of the chemicals from the point of economical application.

The investigations on the dosages have shown that the mercurial

and non-mercurial chemicals such as Ceresan UT 687, Dithane M-45 W.P., Trimangol 80, and Hekmazin were effective at the dosages of 0.15 %, as well as at 0.2 % level (3).

In this study effectiveness of the chemicals were investigated against the wheat common bunt.

MATERIALS and METHODS

The variety of Mentana was used in these studies found as a susceptible variety previously (1,4). The bunt chlamydospores for artificial inoculations were obtained from diseased heads from different parts of the Ege Region.

The microscobic examination of the chlamydospores were identified as **Tilletia foetida** (Wall) Liro and their germination ability were 95 % in 2 % glucose solution after 72 hours.

Ninety groups from Mentana variety were weighted that each group was 100 grams. These groups were artificially inoculated at 0,3 % ratio inoculum in small containers separately. The seeds for control groups were separated and the others were mixed the chemicals their names and levels given on table 1.

Randomized blocks in factorial design was applied and three replication were done. Each plot was 2,5 m^2 and the seeds were sown by hand in 20X5 cm intervals. The counts were done on the diseased and healthy heads at the ripening stage of wheat. The effectiveness of the dosages of the chemicals were found by using Abbott formula and the statistical analyses were applied.

RESULTS and DISCUSSION

The studies have shown that the chemicals with the exception of Hekmazin were found effective at 0,10 % level as well as 0,15 % level of these products were advised by previous experiments (Table 2,3).

On the other hand statistical analyses have shown that the linear effect were significant for all products. The maximum effects (100 %) based on quadratic effects were found at 0,10 % for Ceresan UT 687 and 0,125 % for Dithane M 45 W.P. and Trimangol 80. The level for maximum effect of Hekmazin was 0,15 %.

According to these results Ceresan UT 687, Dithane M 45 W.P., and Trimangol 80 may be advised at 0,1 % levels, against common bunt of wheat. However, a homogen treatment is necessary for high succesfulness by seed treatment. Therefore these levels (0,1 %) of chemicals should be recommended after improving the equipment of the seed treatment or the studies should be expnaded on the new formulations for the chemicals.

Table 1. The chemicals and levels.

CHEMICALS			
Name	Active Ingredient	Formulation	Dosage (g./100 kg. seed) Product
Dithane M45	46,5 % ethylene bisdithiocarbamate ion, 12 % manganese ion, 1,5 % zinc ion.	W.P.	50 (*) 75 100 125 150
Trimangol 80	80 % Maneb	Dust	50 75 100 125 150
Hekmazin	5,5 % Zineb 55 % Maneb	Dust	50 75 100 125 150
Ceresan UT 687	Phenylmercuryacetate (1,5 % mercury)	Dust	50 75 100 125 150
Derosal (Hoe 17411)	2-Carbomethoxy-aminobenzimidazole 60 %.	W.P.	50 75 100 125 150

(*) : L_1 = 50, L_2 = 75, L_3 = 100, L_4 = 125, L_5 = 150 g./100 kg. seed.

Table 2. The percentage of the disease and the effectiveness of the chemicals.

DOSAGES	CHEMICALS									
	Percentage of the disease (%)					Effectiveness of the chemicals (%)				
	Ceresan UT 687	Derosal	Dithane M45	Hekmazin	Trimangol 80	Ceresan UT 687	Derosal	Dithane M45	Hekmazin	Trimangol 80
L_0 (Control)	39.8	57.9	41.5	48.3	46.6	—	—	—	—	—
L_1	6.6	0.1	5.1	6.4	2.1	85.4	99.8	88.0	85.6	95.0
L_2	0.4	0.0	1.2	4.0	0.2	98.8	100.0	96.9	91.8	99.5
L_3	0.0	0.0	0.3	1.7	0.1	100.0	100.0	99.1	96.3	99.8
L_4	0.0	0.0	0.0	0.4	0.0	100.0	100.0	100.0	99.2	100.0
L_5	0.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0	100.0

Table 3. The table of variance.

s.v.	d.f	s.s	m.s	(F)
Total	74	4521.80		
Replication	2	2.90		
Combination	24	4059.80	169.16	
Chemical	4	863.80	215.95**	22.58
Dosage	4	2395.00	598.75**	62.63
Intereaction	16	801.00	50.06**	5.24
CERESAN-Linear	1	692.16	692.16**	72.40
Quadratic	1	356.13	356.13**	37.25
DEROSAL-Linear	1	5.99	5.99	
Quadratic	1	4.28	4.28	
DITHANE-Linear	1	734.09	734.09**	76.78
Quadratic	1	89.76	89.76**	9.39
HEKMAZIN-Linear	1	932.98	932.98**	97.59
Quadratic	1	0.53	0.53	
TRIMANGOL-Linear	1	221.41	221.41**	23.16
Quadratic	1	67.64	67.64**	7.08
ERROR	48	459.10	9.56	

** : Significant at 1 % Level.

(F) Table

5%	1%	d.f.
4.04	7.19	1-48
2.56	3.74	4-48
1.86	2.40	16-48

The effectiveness of Derosal (Hoe 17411) to the bunt disease of wheat was also investigated in the same time and the all tested levels of Derosal (0,05 %, 0,075 % and 0,10 %) were effective. The same problem for the homogen treatment may be thougt for the level of Derosal (0,10 %). But the 0,05 % level of Derosal was also found as effective as at 0,10 % level.

In addition to these results, the linear effect of Derosal was not significant in the range of tested dosages. This showed that there was no-correlation between the dosages and the percent of effects of Derosal. Therefore the studies may be prog-

ressed below the 0,05 % level of Derosal.

The high effectiveness of Derosal at low dosages, may eliminate the problem of seed treatment for lower dosages than 0,15 % level. Although, is it necessary to carry-out large experiments under field conditions before recommendation at 0,1 % level of Derosal.

ÖZET

BUĞDAY ADİ SÜRMESİ (**Tilletia foetida** «Wall» Liro) NE KARŞI İLAÇLI SAVAŞ ÜZERİNE ÇALIŞMALAR

Önceki çalışmalarda Buğday adi sürmesine karşı % 0,15 dozunda etkili bulunan ve uygulamaya verilen bazı i'açların (Ceresan UT 687, Dithane M 45 W.P., Hekmazin, Trimangol 80), % 0,1 lik dozlarının etkinlikleri ve Derosal (Hoe 17411) isimli preparatin, salık verildiği dozlardaki biyolojik aktivitesi bu çalışmada incelenmiştir.

Doğa koşullarında yürütülen çalışmalardan elde edilen hastalık oranlarının istatistiki analizi, Hekmazin dışındaki ilaçların % 0,1 lik dozlarının etkili olduğunu göstermiştir.

İlaçların etkinliği kadar, homojen bir ilaçlamanın da zorunlu olduğu tohum ilaçlamasında bu amaç, ancak yeterli bir doz düzeyinde gerçekleşebilir. Bu ise ilaçlama cihazlarının % 0,1 lik dozda, homogen ilaçlama yapabilecek şekilde gelirtirilmelerini veya ilaç formulasyonlarında bu amaca dönük yeni düzenlemeleri zorunlı kılmaktadır. Ancak, denendiği tüm dozlarda Derosal'in etkili bulunması % 0,1 lik dozlar için, sözü edilen sakıncaları bir ölçüde Derosal için azaltıcı olmaktadır.

Bu nedenle denenen ilaçların % 0,1 düzeyinde biyolojik aktiviteleri saptanmış olmakla birlikte, günümüz uygulama koşullarında ancak % 0,15 doz düzeyinde salık verilebileceği kanısına varılmıştır.

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Competition Between Annual Weeds and Potatoes and weed Control

Suna SÖNMEZ[1] and İbrahim KARACA[2]

ABSTRACT

To determine the critical period of competition between weeds and potato (Variety Cosima) experiments were set up on a clay-loam soil during the years 1972-1973 in Bolu. Main weeds were **Sinanpsis arvensis** L., **Chenopodium album** L. and **Avena fatua** L. and the total numbers of the weeds were 238-423 per square meter. Countings were made after 15, 30,45,60,75,90 and 110 days from the emergence of potato. Weeding during that period resulted in yield 93-216 % more than the plot kept weedy through the growth period.

The effects of applying different pre-emergence herbicides on weed control and yield in potato were compared on clay-loam, sandy-loam and sandy-clay soils.

According to statistical analyses Patoran (5 kg/ha), Afalon (3 kg/ha), Aresin (3 kg/ha), Aresin Kombi (5 kg/ha) and Simazine (2,5 kg/ha) were found excellent herbicides in controlling annual and some grass weeds. These herbicides, except Simazine, did not show any phytotoxicity on potatoes grown on each type of soils. They increased yield on clay-loam and sandy-clay soil while they had no advantage against the hand-weeding control on sandy-loam soil.

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INTRODUCTION

Although the potato has been grown in all provinces of Marmara Region, Bolu has been the leading province for certified potato seed production for last years.

Potatoes, like other horticultural crops, suffer from the effects of weed competition which use up soil nutritions and mo'sture. Under these conditions crop yields can be greatly restricted and digging can be difficult particularly in early crops.

In this study, 14 families consisting of 15 species were found in Bolu. Among them : **Amaranthus retrof'exus** L, **Chenopodium album** L., **Heliotropium europeum** L., **Sinapis arvensis** L., **Equisetum arvense** L., **Circium arvense** (L.) Scop., **Convolvulus arvensis** L., **Veron'ca pers'ca** L., **Anagallis arvensis** L., **Solanum dulcamara** L., **Cynodon dactylon** Pers., **Mentha arvensis** L., **Polygonum convolvulus** L., are the main weeds existed on average 11.95±5.09 in per square meter.

Weed competition studies with other crops showed that weeds emerging with crops are more competitive than those emerging later. Weeds reduced the yields of maize and bean if allowed to compete for 30 days (Nieto et al., 1978). Kasasian and Seeyave (1969) found that field beans and tomatoes need to be kept weed free for 4 weeks after planting to prevent a yield reduction. Yield of sugarbeet roots was reduced when **Kochia scoparia** competed for more than 5 or 6 weeks (Weatherspoon and Scheweizer, 1969). Hill and Santelman (1969) noted that annual weeds emerging 4-6 weeks after planting caused no further reduction in peanut yields. Cotton requires approximately 8 week weed-free period from emergence (Buchanon and Burns, 1969). In another study this period was found 6-8 weeks (Schewerzel and Thomas, 1971).

The problem of weed control has been important to potato growers for many years. In early years there has been an abundance of relatively cheap labor in Marmara Region and growers have been able to have their fields hoed whenever necessary. Since this type of labor is no longer available, some other method of weed control must be developed.

During the last years, many herbicides were tested for weed control in potato fields. Simazine at 0.5 kg/ha effectively controlled weed growth and gave a tuber yield of 189.21 quintals/ha which was significantly higher than the yield from the unweeded control plot and

from hand weeding (Divekar et al., 196). Siviridov (1968) found that Simazine 1-3 kg/ha pre-emergence gave 58 and 74 % weed control respectively in potatoes and did not adversely affect the crop in a dernoalluvial medium loam soil. Particularly good results were obtained with Patoran at the recommended dosage of, 4 kg/ha, applied shortly before emergence (Brade, 1966). Cox (1967) found that Afalon, Aresin and Patoran at 1, 2 kg/ha showed no herbicidal damage except Aresin at 2 kg/ha when sprayed just prior to emergence. Afalon at 1.5 kg/ha applied pre-emergence gave excellent control of weeds and significantly increased potato quality and total yield compared with the uncultivated control whereas Treflan 1 (l/ha) similarly applied, did not increase yield (Smith, 1967). Bramley (1967) reported that Afalon applied at 2 kg/ha pre-emergence gave excellent safe control of broad-leaved weeds but only fair control of grasses and gave increases in total yields.

Sagolovich and Shersneva (1970) reported that Treflan at 2.5 litres/ha applied 20 days before planting thinned the stand but increased yields by 16 %. Sencor at 1 and 2 kg a.i/ha and Afalon at 1, 1.5 and 2 kg a.i/ha gave 90-100 % control against **Commelina** sp., **Capsella bursa pastoris** L., **Lepidium** sp., and **Senecio caryophillacea** (Castillo et al., 1971). Federov (1968) found that 2,4-D amin at 0.8 kg/ha pre-emergence gave good results against some broad-leaved weeds. Zimdahl (1971) noted that Afalon and Patoran at 1.5-2 kg/ha gave good control of annual broad-leaved weeds and grasses and were also non-injurious to potatoes. Aresin 1.25 kg/ha, Afalon 2 kg/ha, Patoran 4 kg/ha were selective to potatoes and gave good control of **Chenopodium album** L., **Solanum nigrum** and **Amaranthus retroflexus** (Rapparini, 1971). Bayer (1971) noted that Afalon 1-1.5 lb/acre controlled both grasses and broad-leaved weeds on agravelly silt loam soil. Aamisepp (1971) found that Afalon 1.25 kg/ha gave good control of broad-leaved weeds in potatoes. Aretit and Patoran each at 3 kg/ha proved to be the most effective herbicides against the broad-leaved weeds in alluvial meadow soil.

The objectives of this study were to determine (1) the lenght of time after potato emergence that weeds may be allowed to compete before reducing potato yields; (2) The period of weed-free maintenance after potato emergence required to produce maximum potato yield; (3) the influence of weed competition on height, branching and yield of potato; (4) and taking this point into consideration, to find out the adequate chemical control method in potato fields.

MATERIALS and METHODS

1. Competition Between Weeds and Potatoes

Determination of the critical period of competition between weeds and potatoes was studied on clay-loam soil during 1972 and 1973 in Bolu. The trials established in randomised block desing with four replications. The treatments themselves consisted of cultural practices carried out at different times after sowing date, as below;

Treatment

Weed-infested for the first	Free of weeds for the first
-15 days and free upto time of harvest	-15 days and weed-infested until time of harvest
-30 « « «	-30 « « «
-45 « « «	-45 « « «
-60 « « «	-60 « « «
-75 « « «	-75 « « «
-90 « « «	-90 « « «
-100 (Control : Weed-infested up to time of harvest)	-110 (Control : Free from weeds up to time of harvest)

In the two years, potato was sown in early April. Individual plots were 3 rows and 25 seed of «Cosima variety» were sown in each rows with 50 cm apart and 70 cm long. Potatoes were adequately fertilized and were furrow irrigated twice during the growth period.

The weeds were seperated into four groups (a) **Avena fatua** L., (b) **Chenopodium album** L., (c) **Amaranthus retroflexus** L. and (d) other broad-leaved weeds. Weed removal was performed by two means, hand-pulling and shallow hoeing. Weeds were counted in a square meter in three different points of each plot before each removal.

Potatoes were harvested for yield from each plot and the yield of 33 plants, individualy, weighed. Besides, at the ripening time, height and branching of 33 plants were measured and counted.

The critical periods between weeds and potatoes were explained

according to cumulative graph in every year. Correlation coefficients were computed between the potato yield, height, branching and weed removal periods.

2. Chemical Weed Control in Potato

Experiments were carried out in Bolu on clay-loam, sandy-loam and sandy-clay soil during 1972-1973. The variety Cosima was used throughout. A randomized block design with three replications was used in each soil type. Each plot was 10 m long and contained three rows spaced 70 cm apart. Potatoes were adequately fertilized and were furrow irrigated twice in growth period.

In the two year-test, Afalon (3 kg/ha), Aresin (3 kg/ha), Patoran (5 kg/ha), Aresin-Kombi (5 kg/ha), Bladex (3 kg/ha), Simazin (2.5 kg/ha), Treflan (2.5 1/ha) and 2.4-D amin (2 1/ha) were applied one day after sowing.

The predominant weed species were **Sinapis arvensis** L., **Amaranthus retroflexus** L., **Chenopodium album** L., **Heliotropium europeum** L., **Euphorbia pinea** L., **Circium arvense** (L.) Scop, **Convolvulus arvensis** L., **Veronica persica** L., **Anagallis arvensis** L., **Medicago falcata** L., **Lathyrus hirsitus** L., **Mentha arvense** L., **Ranunculus arvensis** L., **Verbana officinalis** L., **Lepidium draba** L., **Lactuca scariola** L., **Adonis flammeus** L., **Fumaria officinalis** L., **Xanthium spinosum** L., **Allium paniculatum** L., **Polygonum convolvulus** L. and **Equisetum arvense** L.

Plots were checked 15 days, 30 days and 45 days after applications. The effectiveneses of the herbicides were compared with untreated checks.

Yield, height and branching were recorded from 33 plants in each plot and were compared with untreated and hand weeding checks. All plots were harvested in the first week of September.

Significant differences among treatments were tested with Duncan's multiple range test at the 5 % level of significance. Analyses could not be combined over years since treatments were changed somewhat each year.

RESULTS and DISCUSSION

Critical period of weed competition with potato : The experiments showed that during the first 15 days weeds did not vigorously affect potato yields. It was found that weed control was necessary between the 15th and 45th or 49th days after emergence (Figure 1). Weeding during this period results in yield 93-216 % more than the plot kept weedy throughout the growth period. Weed competition after the 45th or 49th days had no effect on

yields. So, it is not important to control weeds during the first 15 days and/or after 54th or 49th days.

Correlation between potato yield, height, branching and weed removal periods : Yield, height and branching of potato were negatively correlated to increasing weedy periods while they were possitively correlated to weed-free periods. But it was found that there was no correlation between weedfree periods and height of potato.

Chemical Weed Control : All treatments gave excellent weed control in a rate of 76-100 % **A. retroflexus** L., **Ch. album** L., **S. arvensis** L., **P. convolvulus** L., **H. euro-**

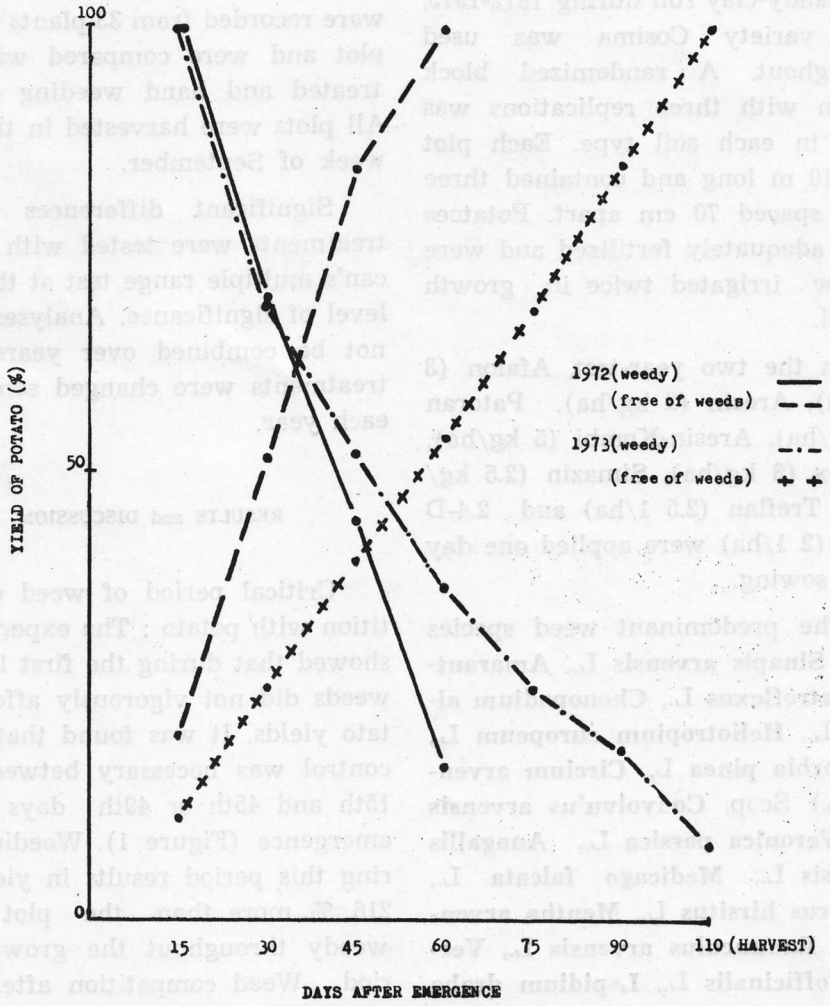

Figure 1. Potato-yield for various treatments.

peum L., **V. persica** L., **E. pinea** L., **M. falcata** L., **L. hirsitus** L., **R. arvensis** L., **V. officinalis** L., **L. draba** L., **L. scariola** L., **A. flammeus** L. Such weeds as **C. arvense** (L.) Scop., **C. arvensis L, E. arvense** L., **M. arvense** L., **F. officinalis** L., **X. spinosum** L., **A. paniculatum** L. were not controlled by all herbicies while **S. arvensis** L. only by Treflan. According to statistical analyses, Patoran, Afalon, Aresin-Kombi and Simazine were excellent herbicides controlling weeds comparing with other herbicides (Table 1, 2, 3).

Effect of Herbicides on height, branching and yield of potato : According to the statistical analyses; Afalon, Patoran, Aresin and Aresin-Kombi did not show any Phytoto-

Table I. Studies on control of weeds in patoto on sandy-clay soil

Years	1972									1973						
g / da	300 g	500 g	300 g	500 g	250 cc	250 g	200 cc	300 g	300 g	500 g	300 g	500 g	250 cc	250 g	200 cc	300 g
Chemicals / Weeds	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex
A.paniculatum	65.9	65.6	53.3	54.3	56.5	64.5	69.0	51.3								
S.arvensis	99.1	100.0	99.0	93.3	67.1	97.3	71.7	87.7	98.0	100.0	95.2	91.8	57.8	96.3	88.2	89.2
C.arvense	51.0	56.0	52.2	48.1	40.0	55.3	51.5	47.2	65.2	63.5	62.5	56.1	33.6	67.8	68.5	36.1
V.persica	96.0	96.1	91.4	85.6	98.4	100.0	73.5	82.9	76.4	79.4	76.4	70.5	73.5	97.0	70.5	73.5
A.arvensis	99.5	99.1	97.4	93.6	90.0	97.9	95.4	94.9	98.4	100.0	97.7	94.3	92.4	97.3	90.6	93.6
E.pinea	98.3	100.0	96.4	92.6	83.5	88.9	80.1	87.8	95.7	96.4	87.3	81.6	84.5	88.7	78.7	81.6
M.falcata	100.0	100.0	95.6	88.1	87.5	91.6	78.1	95.3	96.0	100.0	92.0	88.0	84.0	100.0	80.0	92.0
C.arvensis	57.6	60.9	45.5	53.5	51.5	61.1	57.5	48.5	48.6	57.6	47.7	44.1	45.9	67.5	69.3	44.1
Ch.album									100.0	100.0	100.0	90.4	90.4	95.2	83.3	88.0
M.arvensis									76.9	82.0	75.6	73.0	61.5	74.3	80.7	70.5
V.officimalis									94.2	95.0	92.2	83.6	87.7	86.0	89.3	83.4
C.dactylon									41.0	49.7	37.8	15.0	26.9	60.7	21.0	22.8
Ph.communis									40.0	40.7	37.0	33.3	22.2	44.4	44.4	26.9
L.scariola									91.8	93.4	91.8	83.5	90.1	86.8	90.1	72.1
Ave.	83.3	84.7	78.8	76.2	72.3	82.1	71.0	74.4	78.8	81.3	76.4	70.0	65.4	81.2	73.2	67.4
Significant 1%	F = 44.6 > 3.40 X									F = 29.9 > 2.74 X						

xicity on potatoes on each type of soils. They increased yields on clay-loam and sandyclay soil while they had no advantage against the hand-weeding control on sandy-loam soil (Table 4).

Simazine, Bladex, Treflan and 2,4-D reduced yields compared with hand weeding control plot on clay-loam and sandy-loam soil, but gave nearly as much yields as the hand-weeding control on sandy-clay-soil.

Table 2. Studies on control of weeds in potato on clay-loam soil

Years	1972							1973							
g / da	300 g	500 g	300 g	500 g	250 cc	250 g	200 cc	300 g	300 g	500 g	300 g	500 g	250 cc	250 g	200 cc	300
Chemicals / Weeds	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex
C.arvense	51.3	62.8	58.7	50.2	47.8	59.4	62.6	53.3								
V.persica	100.0	100.0	94.7	87.4	88.2	91.2	82.4	89.8								
A.retroflexus	99.5	99.5	99.1	97.2	96.8	87.9	85.4	97.9								
C.arvensis	60.2	43.7	49.5	50.1	56.5	56.5	55.9	50.7	48.6	54.1	39.2	47.0	32.0	57.1	56.3	43.4
E.pinea	97.7	100.0	89.1	86.1	87.7	81.0	78.4	85.5	97.1	97.5	89.9	87.0	82.2	93.7	85.5	78.3
M.falcata	99.5	99.4	98.9	91.0	91.9	96.9	91.6	95.4	100.0	99.3	100.0	95.2	86.3	100.0	88.3	92.4
C.album	99.3	99.8	96.6	99.9	93.2	99.8	83.5	97.1	100.0	100.0	100.0	93.0	90.2	99.7	86.4	94.4
P.convolvulus									98.6	98.6	93.4	96.0	82.6	97.3	85.5	86.1
H.europeus									99.6	100.0	99.2	93.6	90.8	99.6	86.1	91.2
A.arvensis									100.0	100.0	99.2	93.6	90.8	99.6	86.1	91.2
S.arvensis									100.0	100.0	93.5	93.5	67.7	100.0	83.8	90.3
L.hirsitus									97.1	100.0	93.5	79.3	52.5	94.8	74.3	73.0
X.spinosum									37.3	34.6	33.3	32.0	28.0	32.0	30.0	26.6
A.flammeus									100.0	100.0	88.2	70.5	76.4	100.0	76.4	88.2
M.arvensis									51.7	55.1	46.2	48.2	41.3	62.0	68.9	44.8
A.paniculatum									50.0	50.0	45.0	40.0	35.0	60.0	55.0	40.0
R.arvensis									96.8	97.8	94.6	77.6	75.5	84.0	91.4	72.3
L.draba									100.0	100.0	100.0	82.3	37.2	98.0	92.1	82.3
Ave.	86.1	86.4	84.2	80.3	80.3	82.2	77.1	79.8	85.1	85.8	81.0	75.2	66.3	85.2	76.6	73.3
Significant 1%	F = 5.8) 3.10 (M)								F = 19.8) 2.16 (M)							

Table 3. Studies on control of weeds in potato on sandy-loam soil

Years	1972								1973							
g / da	300 g	500 g	300 g	500 g	500 cc	250 g	200 cc	300 g	300 g	500 g	300 g	500 g	250 cc	250 g	200 cc	300 g
Chemicals / Weeds	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex	Afalon	Patoran	Aresin	Aresin-Kombi	Treflan	Simazin	Weed Killer-D	Bladex
C.arvensis	48.0	53.8	50.4	46.8	54.3	47.7	55.8	57.0								
A.arvensis	97.4	97.2	97.4	97.9	90.2	95.3	76.4	91.4								
M.arvensis	78.1	81.2	76.9	77.6	61.8	84.4	76.1	77.7								
V.persica	97.5	93.3	91.6	92.2	81.6	97.5	80.0	83.3								
S.arvensis	99.7	97.7	98.7	96.3	66.4	95.4	76.2	95.0	100.0	100.0	100.0	93.3	53.3	100.0	66.0	86.0
E.pinea	95.3	91.5	91.5	91.1	80.1	92.7	77.3	82.9	96.7	96.2	90.2	82.2	82.2	97.0	83.2	80.0
C.arvensis	51.7	58.0	48.4	49.5	63.5	51.9	62.4	51.7	32.1	30.3	28.5	26.7	25.0	67.6	66.0	28.5
F.falcata									98.6	99.1	92.2	81.7	76.2	95.0	86.4	91.4
P.convolvulus									95.7	97.2	94.1	88.6	77.0	95.4	85.6	88.0
Ch.album									100.0	100.0	100.0	97.0	94.0	10.0	81.0	94.5
H.europeum									100.0	100.0	96.1	82.6	82.6	82.6	71.1	76.9
L.hirsitus									99.2	100.0	92.5	87.0	55.5	9..5	79.6	83.3
F.officinalis									70.0	60.0	65.0	50.0	50.0	70.0	55.0	55.0
C.intybus									96.0	96.0	84.0	84.0	76.0	9..0	88.0	80.0
C.dactylon									47.3	46.0	28.9	38.1	43.4	69.7	19.7	27.6
Ave.	80.9	81.8	79.2	73.0	71.1	80.7	72.0	77.5	85.0	84.2	79.2	73.7	65.0	83.3	72.-	71.9
Significant 1 %	F= 9.41 > 3.10 M								F= 14.4 > 2.14 M							

Table 4. Effect of the herbicides on height, branching and yield of potatoes comparing with hand-weeding and weedy control.

Treatments	Sandy-Clay			Clay-loam			Sandy-loam		
	Height	Branching	Yield	Height	Branching	Yield	Height	Branching	Yield
Afalon	67.3	7.1	777.77	70.8	6.6	813	65.0	6.2	936.0
Patoran	67.6	7.1	776.00	69.2	6.5	856	69.3	6.6	956.0
Aresin	65.8	6.8	721.33	67.4	6.3	729.6	68.4	6.2	913.3
Aresin-Kombi	64.6	6.3	633.00	65.8	6.2	616.6	61.8	5.7	881.6
Treflan	61.4	5.7	569.00	61.3	5.0	593.3	60.5	5.0	642.3
Simazime	60.4	5.3	532.33	59.2	5.0	516.3	57.9	5.3	616.0
Weed killer-D	60.8	5.5	562.33	61.4	5.6	540.6	59.4	5.2	702.3
Bladex	60.5	5.7	578.00	61.9	5.1	542.6	58.2	5.2	661.6
Hand-weeding control	62.8	6.0	631.33	62.7	5.6	656.0	61.7	5.8	826.6
Weedy Control	51.4	3.7	295.00	51.1	3.5	342.6	45.8	3.7	323.0

ÖZET

PATATES TARLALARINDAKİ TEK SENELİK YABANCI OTLAR ve KONTROL OLANAKLARI ÜZERİNDE ARAŞTIRMALAR

Patateslerde yabancıotların rekabette o'd kları kritik dönemin saptanması amacıyla denemeler, Kozima çeşidi patateste, killi-tınlı bir toprakta **S. arvensis** L. (Yabani Hardal), **C. album** L. (Kazayağı) ve **A. fatua** L. (Yabani Yulaf)'nın hakim olduğu bir yabancıot örtüsünde açılmıştır. Bu denemede Patatesler çıkıştan itibaren gelişme periyodu içinde 15, 30, 45, 60, 75, 90, 110 gün (hasad) otlu ve otsuz tutulmuşlardır.

Buna göre, Patateslerin ve yabancıotların çıkışından itibaren 15. gün rekabetin başlangıcı, bundan sonra 45-49; güne değin geçen 30-34 günlük sürenin ise rekabet dönemi ve yine 45. veya 49. günlerin rekabetin bitim noktası olduğu saptanmıştır. Patateslerin ilk 15 gün otlu tutulması ve 45-49. günlerden sonra ot alımı yapılması ise üründe önemli seviyede artış meydana getirmemektedir. Rekabet dönemi içinde yapılacak ot alımı, bütün mevsim otlu tutulan parsellere göre, üründe % 93-216 oranında artış meydana getirmektedir.

Ayrıca, otlu bırakma sürelerinin artması boy uzunluğu, kol adedi ve üründe azalma yapmakta, otsuz kalma sürelerinin artması ise kol adedi ve üründe artış sağlarken, boy üzerinde farklılık yapmamaktadır.

Yapılan ilâçlı savaş denemelerinde ise, rekabet dönemi süresince yabancıotları kontrol etme imkânı olan pre-emergens (çıkış öncesi) ilâçlarla çalışılmıştır. Kumlu-killi, killi-tınlı ve kumlu-tınlı olmak üzere üç ayrı toprak yapısında açılan denemelerde ilâçların yabancıotlara karşı etkileri yanında, patates bitki boyları, kol adedi ve yumru verimi üzerindeki etkileri de araştırılmıştır. Buna göre;

— Kumlu-killi topraklarda : Patoran 5 kg/ha, Afalon ve Aresin 3 kg/ha dozlarda

— Killi-tınlı ve kumlu-tınlı topraklarda : Patoran ve Aresin-Kombi 5 kg/ha, Afalon ve Aresin 3 kg/ha dozlarda

dikimden 1 gün sonra kullanıldıklarında tüm yabancıotlara karşı % 76-100 etkili olmakta ve üründe çapalı kontrola nazaran artış meydana getirmektedirler. Yalnız kumlu-tınlı topraklarda ilâçların ürüne yansıyan etkileri ot alımı yapılan parsellere göre farklı olmamakla beraber yabancıot çıkışlarını engellemeleri ve çapalama adedini azaltmaları bakımından öğütlenebilir.

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