The Effect of Some Biological Preparations On Soil Borne Pathogens and Nematodes IN Tomatoes and Turfgrass

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THE ANCESTORS OF LIFE

The first life on earth began in the water with photosynthesis bacteria.

These bacteria were responsible for synthesizing enzymes, protein, aminoacids, hormones, and vitamins.

They are also capable of converting solar energy into bioenergy.

They had fulfilled one of their main purposes by the time petroleum had formed and then they went into a deep sleep within carbon molecules.

*İHSAN ORGANIK offers a solution for our world using economical & natural ways by creating a new technology in agriculture using these bacteria.

Our Mission…

- Using our old friends in reviving agriculture and combating these problems.
- Using these miraculous creations we developed a completely organic, complex microbial, **all in one** solution…

İhsan ORGANİK

COMPOSITION

- 100% organic liquid
- 16 key elements for soil nourishment including nitrogen, phosphorus, potash, iron, copper, zinc, manganese and calcium
- over 60 of the total 90 minerals found in soil, at ppm level.
- Beneficial natural bacteria
- Amino acids
- Algae
- Yeast
- Fungus
- Fulvic acid
- Vitamins(B12,D3,folic acid)

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THE BACTERIA IN BIONUR

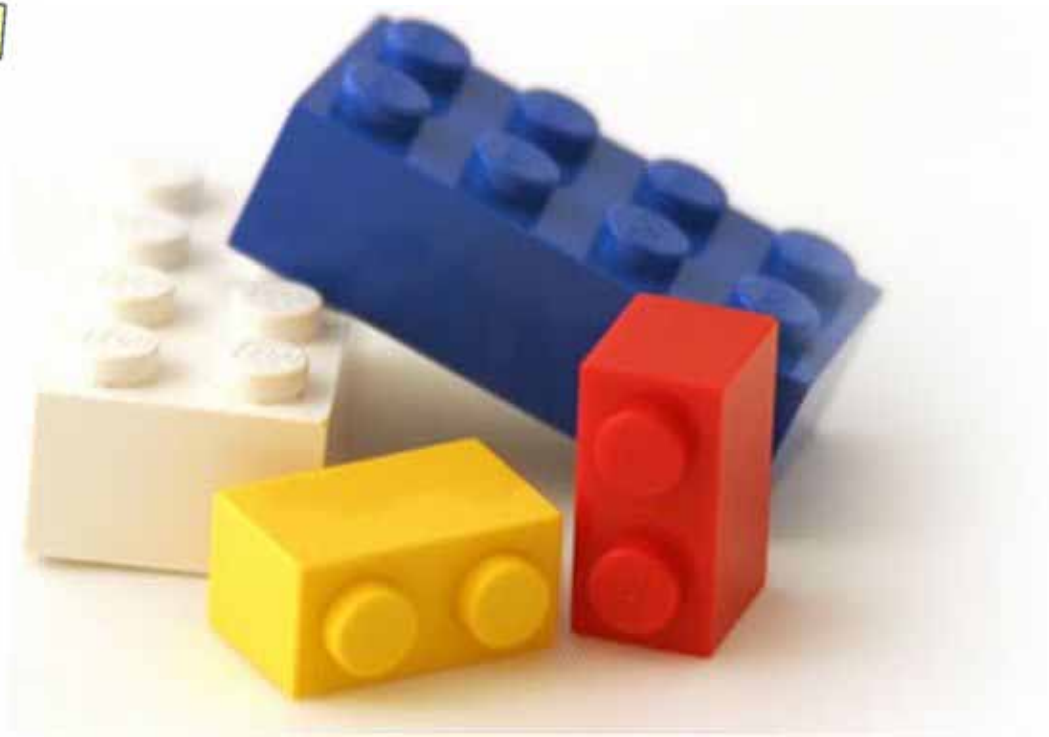
Group	Microorganism	Type	Species	Strain
PHOTOSYNTHETIC BACTERIA				
OxidizesS , N fixation, Denitrifikation	Bacteria	*Thiobacillus ferreoxidan*		
	Bacteria	*Thiobacillus thiooxidan*		
	Bacteria	*Thiobacillus thioparus*		
N fixation, Polisakkarit	Bacteria	*Arthrobacter*	*viscosus*	
P solubilizer, N fixation, Denitrifikation	Bacteria	*Bacillus*	*megaterium*	*subgroup A*
	Bacteria	*Bacillus*	*megaterium*	*subgroup B*
P, K solubilizer	Bacteria	*Brevibacillus*	*choshinensis*	
Smell, Aroma, Shelf life	Bacteria	*Deinococcus*	*erythromyxa*	
	Bacteria	*Micrococcus*	*luteus*	*subgroup C*
	Bacteria	*Micrococcus*	*lylae*	*subgroup A*
N fixation	Bacteria	*Psychrobacter*	*phenylpyruvicus*	

Group	Microorganism	Type	Species	Strain
LACTIC ACID BACTERIA				
	Bacteria	Lactobacillus acidophilus		
Lactic acid bacteria produce lactic acid from sugars and other carbohydrates, developed by photosynthetic bacteria and yeast. Lactic acid is a strong sterilizing compound and suppresses harmful microorganisms and enhances decomposition of organic matter. Moreover, Lactic acid bacteria promote the fermentation and decomposition of material such as lignin and cellulose, thereby removing undesirable effects of undecomposed organic matter. Lactic acid bacteria have the ability to suppress disease-inducing microorganisms such as Fusarium, which occurring continuous cropping programmes. Under normal circumstances, species such as Fusarium weakens crop plants, thereby exposing them to diseases and increased pest population such as nematodes. The use of lactic acid bacteria reduces nematode populations and controls propagation and spread of Fusarium, thereby inducing a better environment for crop growth.				
FUNGUS				
They are natural antibiotics which protect plants against diseases and kill dangerous bacteria and microorganism				
	Fungus	*Penicillum*	*sp*	
ALGAE				
Algae are early colonizers of newly exposed material in wet situations such as paddy fields and the very widespread shallow pools in the arctic. When in sufficient numbers they help to form a crust at the soil surface thereby preventing soil erosion. They are considered as early initiators of the carbon and nitrogen cycle.				

Group	Microorganism	Type	Species	Strain
YEAST (SACCHAROMYCES)				
Yeasts synthesize any microbial and other useful substances required for plant growth from amino acid and sugars secreted by photosynthetic bacteria, organic matter and plant roots. The bioactive substances such as hormones and enzymes produced by yeasts promote active cell and root division. These secretions are also useful substrates for Effective Microorganisms such as Lactic acid bacteria	Yeast	Candida	fructus	
	Yeast	Candida	lambica	
	Yeast	Candida	lusitaniae	
	Yeast	Candida	maritima	
	Yeast	Candida	philyla	
	Yeast	Candida	sake	
	Yeast	Candida	tropicalis	
	Yeast	Candida	valida	
	Yeast	Candida	zeylanoides	
	Yeast	Cryptococcus	albidus	var. albidus
	Yeast	Cryptococcus	neoformans	subgroup B
	Yeast	Dekkera	custersiana	
	Yeast	Kluyveromyces	marxianus	var. lactis
	Yeast	Rhodotorula	rubra	
	Yeast	Trichosporon	beigelii	subgroup A

AMINO-ACIDS

Alanine
Glutamic Acid
Glycine
Histidine
Isoleucine
Leucine
Methionine
Phenylalanine
Serinine
Threonine
Tryptophan
Valine



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USES AS A PLANT REGULATOR

- accelerates plant growth
- boosts photosynthesis
- strengthens stems and leaf nodules
- improves resilience to transport stress
- prolongs life-span of blooms
- suits root, foliar application & drip irrigation
- strengthens root systems
- increases mineral content of soil
- enables roots to easily absorb soil minerals
- revitalises the organic substances in soil
- raises soil microbial levels
- corrects soil salinity levels protects against soil diseases
- rebalances soil composition to pH 6.0

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USES AS A PLANT REGULATOR

- Improvement in soil quality, convenient cultivation and decline in usage of chemical fertilizers
- Strong root development
- Budding
- Shooting
- Blooming
- Crop formation
- Maturation
- Longevity (enhances shelf life)
- Resilient to cold (-4 ^{o}C)

USES AS A BIOCONTROL AGENT

- Powdery mildew
- Downy mildew
- Apple scrap dieases
- Botrytis cinerae
- Alternia early blight
- Fusarium sp.
- Bacterial wilt
- Acari (European red mite, Brown mite, Straw mite)
- Leaf miner
- Pinus scale insect

Disposition

- **Microbial Bionur Preparations**

- **Effect of some biological preparations against Root rot diseases in tomato caused by *Fusarium oxysporum* f.sp. *radicis-lycopersici* and *Pythium deliense***

- **The effects of some biopreparations and activators on root rot fungal diseases caused by *Fusarium graminearum* and *Rhizoctonia cerealis* on Turfgrass**

- **Suppressive effects of Bionur and Akvasis including Thiobacillus bacteria to Root knot nematode on tomatoes under controlled conditions**



Objective 1

Effect of some biological preparations against root rot diseases in tomato caused by *Fusarium oxysporum* f.sp. *radicis-lycopersici* and *Pythium deliense*

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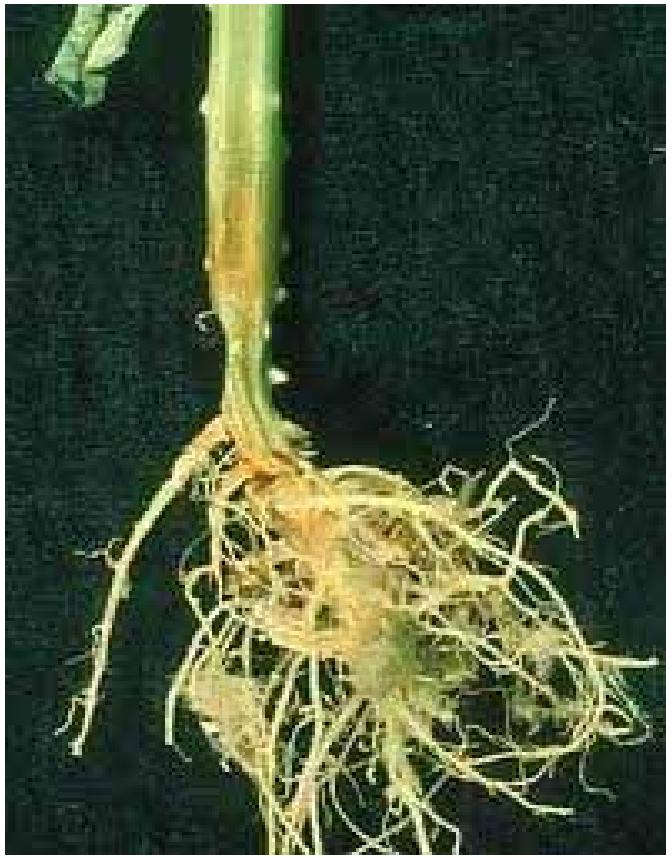
Fusarium oxysporum f.sp. radicis-lycopersici (FORL) and *Pythium deliense* are widespread soil borne diseases in tomatoes in the world,

They cause vascular wilt, crown and root rot and significant losses in tomato production.

***Fusarium oxysporum f. sp. radicis-lycopersici* (FORL)**



Pythium deliense

MATERIAL METHODS

The seedlings were transplanted and after one week biological preparations with different concentrations other than TD 19 were applied in pots. After TD19 in different concentrations was applied, tomato seedlings were transplanted in pots.

Treatment products	Rate of microbial preparations		
	Low Dose	Normal Dose	High Dose
Akvensis	100 ml/100L	200ml/100L	400ml/100L
TD19	250g/100L	500 g/100L	1000 g/100L
Bacillus subtilis	62.5 g/100L	125g/100L	250g/100L
Bionur microbial	300ml/100L	600ml/100L	1200ml/100L
Control	water	water	water

Cultures of Fusarium rot disease and Phytium disease were isolated from greenhouse tomato crops in Antalya, Turkey.

Diseases were cultured on potato dextrose agar (PDA) and stored at 4°C.

Fungi were incubated for10 days at 23°C.

Fifteen days after transplanting, seedlings were inoculated with 15 ml of conidial suspensions at a concentration of $1X10^6$ spores/ml.

After inoculation, plants were immediately covered with plastic bags for 48 hours to ensure high relative humidity.

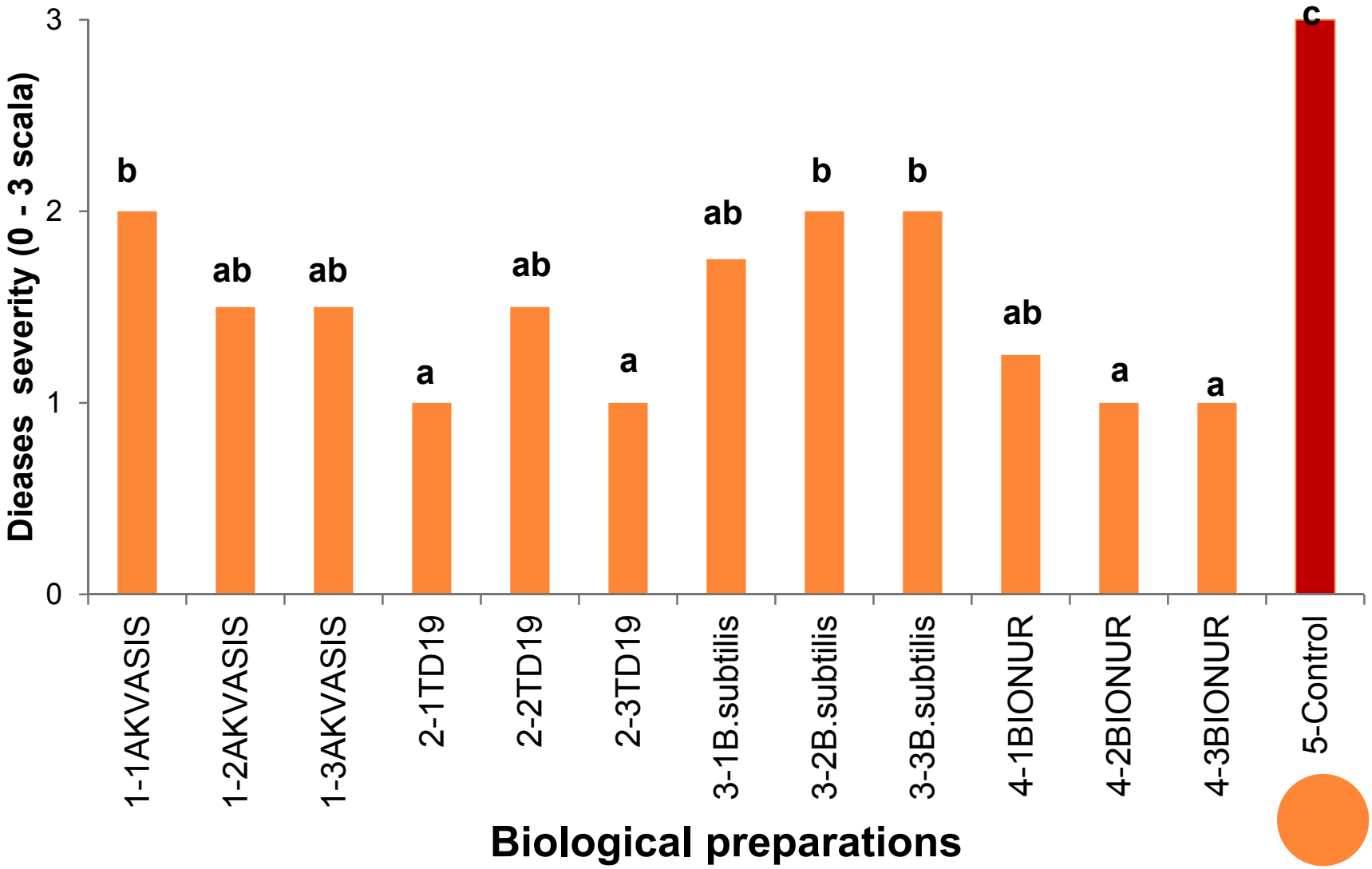
Plants were analysed 21 days after inoculation .

Disease severity for FORL was rated on a scale of 0 to 3 in which
0 : symptomless,
1 : slight brown discoloration of the upper root system,
2 : moderate brown discoloration of two-thirds or less of the upper root system,
3 : extreme brown discoloration of the upper root system and numerous necrotic lesions extending up the crown and stem, and seedling dead or nearly so .

Disease severity for *P. deliense* was rated on a scale of 0 to 4 in which
0: symptomless,
1: less than 30% of leaves wilting;
2: more than 30% of leaves wilting, sometimes first symptoms of stem necrosis;
3: all leaves wilting and moderate to severe necrosis of stem (and leaf) tissue
4: plant completely necrotic.

RESULTS

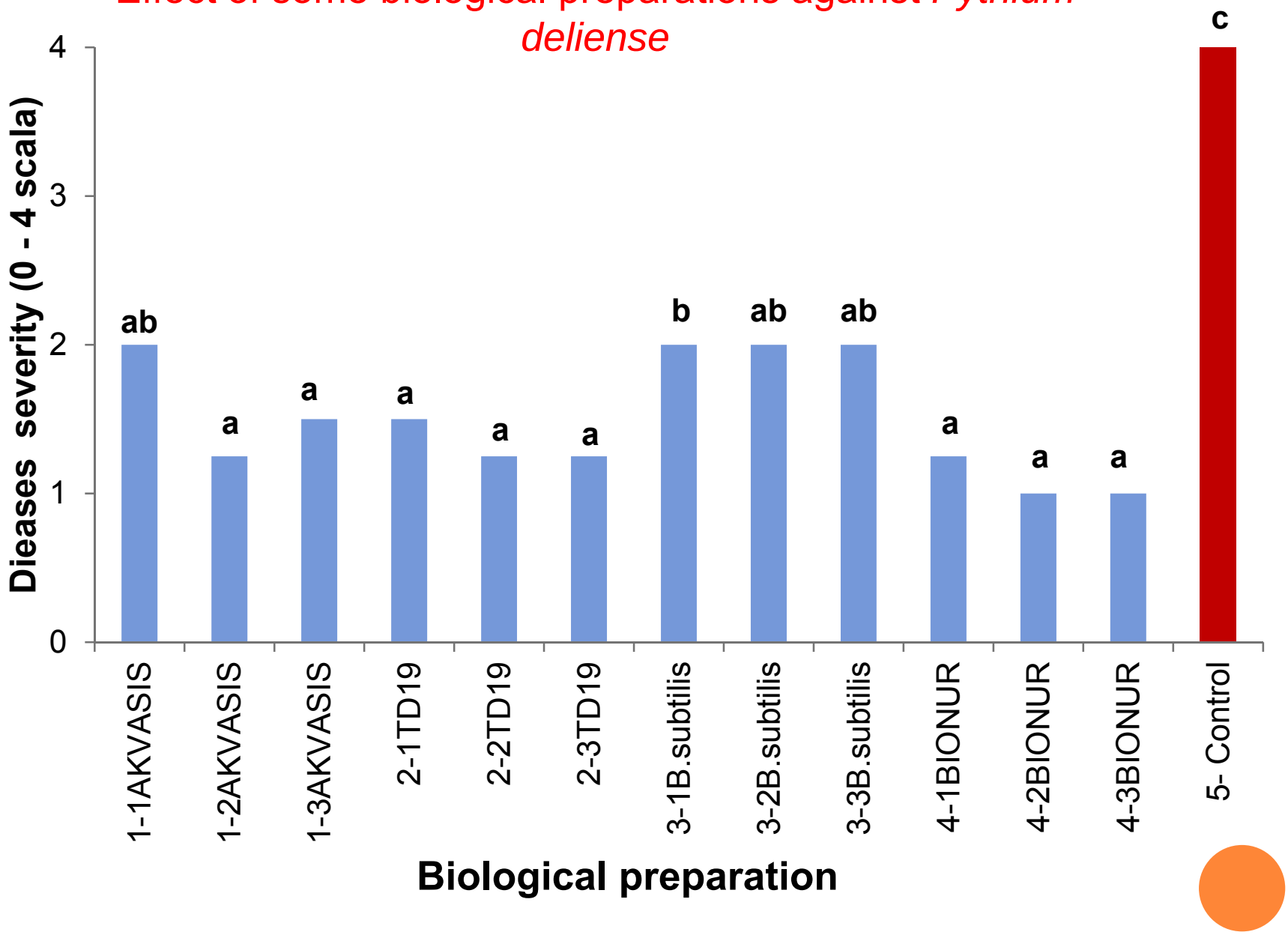
Effect of some biological preparations against root rot diseases in tomatoes caused by *Fusarium oxysporum* f.sp. *radicis-lycopersici*



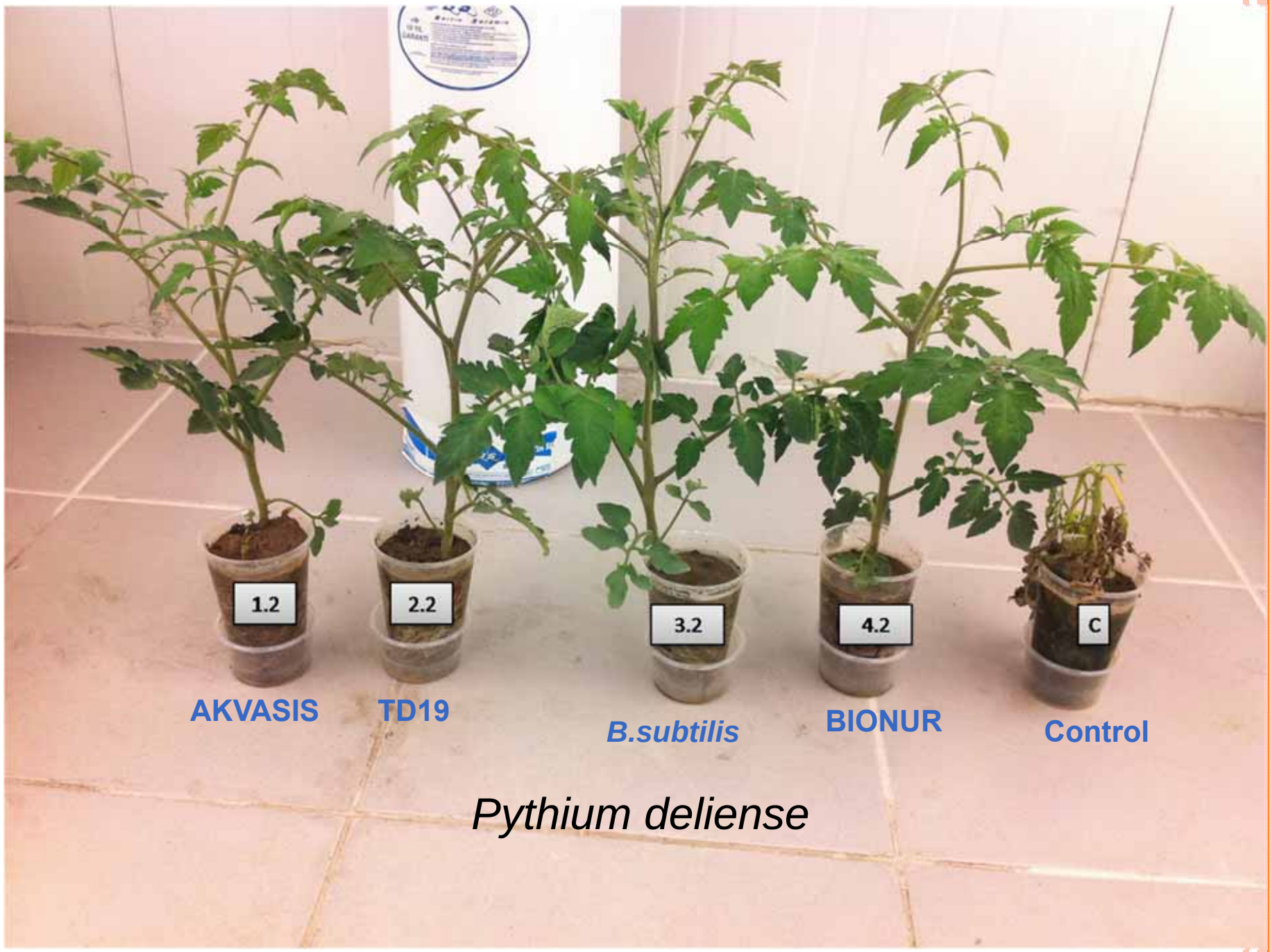
P<0.05 according to Duncan Multiply Compared Test.


Control
Bionur (4-2)
Fusarium oxysporum f. sp. radicis-lycopersici (FORL)

Effect of some biological preparations against *Pythium deliense*



P<0.05 according to Duncan Multiply Compared Test.


1.2
2.2
3.2
4.2
C
AKVASIS
TD19
B.subtilis
BIONUR
Control
Pythium deliense

Objective 2

The effects of some biopreparations and activators on root rot fungal diseases caused by *Fusarium graminearum* and *Rhizoctonia cerealis* on Turfgrass

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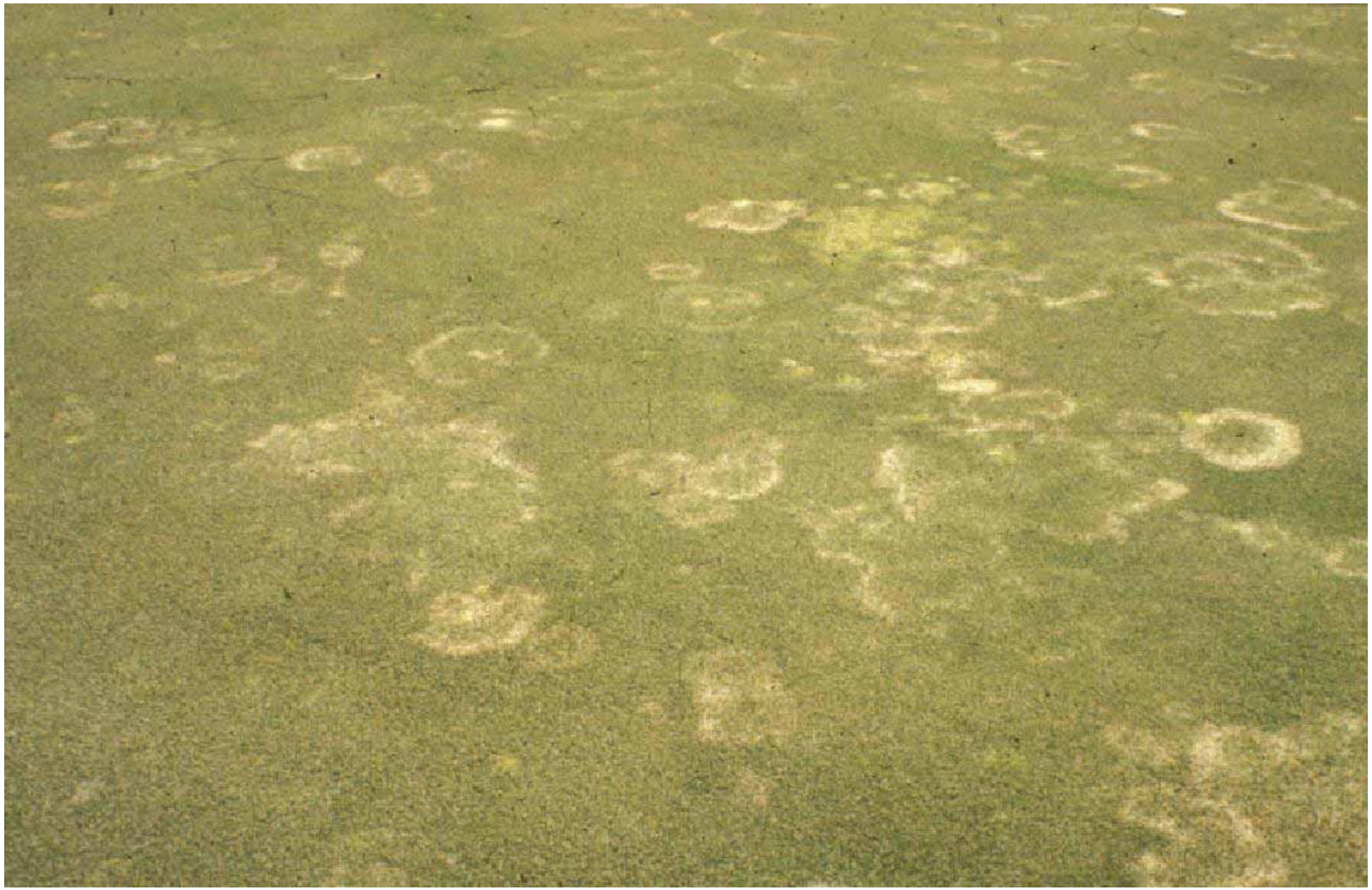
YELLOW PATCH CAUSED BY *RHIZOCTONIA CEREALIS*



ROT CAUSED BY *FUSARIUM GRAMINEARUM*

Materials

- Plant material :

  Lolium perenne (L.)

  Perennial ryegrass

- Pathogens:
  - *Fusarium graminearum*
  - *Rhizoctonia solani*

The Steps of the Experiments

- Growing plant material from seeds
- Application of bioactivator doses
- Application of pathogens
- Evaluation

BIOPREPARATIONS AND DOSES

Biopreparations	Doses		
	Dose 1	Dose 2	Dose 3
Bionur Microbial (cc/ 100 L tap water)	300	600	1200
Akvasis (cc / 100 L tab water)	100	200	400
Bacillus subtilis (g /100 tap water)	62.5	125	250
Bionur TD 19 G (kg / da)	50	100	200

RESULTS

THE EFFECT OF BIOPREPARATIONS ON *FUSARIUM GRAMINEARUM*

Treatments	Diseases severity (%)	% Effect
Control	75,0 **b***	**-**
Bionur 300cc	26,9 **a**	**64,1**
Bionur 600cc	21,4 **a**	**71,5**
Bionur 1200cc	21,1 **a**	**71,9**

Treatments	Disease severity (%)	% Effect
Control	75,0 **c***	**-**
Akvasis 100cc	34,7 **b**	**53,7**
Akvasis 200cc	32,2 **b**	**57,0**
Akvasis 400cc	24,2 **a**	**67,8**

Treatments	Disease severity (%)	% Effect
Control	75,0 **b***	**-**
Bionur TD19 50kg	44,4 **a**	**40,7**
Bionur TD19 100kg	51,4 **a**	**31,5**
Bionur TD19 200kg	41,7 **a**	**44,4**

Teatments	Disease severity (%)	% Effect
Control	75,0 **c***	**-**
B. subtilis 62,5 g	31,9 **b**	**57,4**
B. subtilis 125 g	24,4 **a**	**67,4**
B. subtilis 250 g	25,0 **a**	**66,7**

*Means within the column following different letters are significant according to Fisher's LSD test (P<0,05)

THE EFFECT OF BIOPREPARATIONS ON *RHIZOCTONIA CEREALIS*

Treatments	Disease severity (%)	% Effect
Control	59,7 **c***	**-**
Bionur 300cc	31,4 **b**	**47,4**
Bionur 600cc	21,7 **ab**	**63,7**
Bionur 1200cc	13,1 **a**	**78,1**

Treatments	Disease severity (%)	% Effect
Control	59,7 **c***	-
Akvasis 100cc	43,9 **b**	26,5
Akvasis 200cc	34,2**ab**	42,8
Akvasis 400cc	23,6**a**	60,5

Treatments	Disease severity (%)	% Effect
Control	59,7 **b***	**-**
Bionur TD19 50kg	51,9 **b**	**13,0**
Bionur TD19 100kg	38,9 **a**	**34,9**
Bionur TD19 200kg	31,9 **a**	**46,5**

Treatments	Disease severity (%)	% Effect
Control	59,7 **c***	**-**
B. subtilis 62,5 g	55,8 **bc**	**6,5**
B. subtilis 125 g	44,4 **ab**	**25,6**
B. subtilis 250 g	33,3 **a**	**44,2**

*Means within the column following different letters are significant according to Fisher's LSD test (P<0,05)

THE EFFECT OF BIOPREPARATIONS ON FRESH WEIGHT OF *LOLIUM PERENNE*

Treatments	Fresh weight (g)	% Increases
Control	3,76 **d***	-
Bionur 300cc	7,52 **c**	**50,0**
Bionur 600cc	8,61 **b**	**56,3**
Bionur 1200cc	10,07 **a**	**62,7**

Treatments	Fresh weight (g)	% Increase
Control	3,76 **d***	**-**
Akvasis 100cc	6,16 **c**	**39,0**
Akvasis 200cc	8,51 **b**	**55,8**
Akvasis 400cc	8,72 **a**	**56,9**

Treatments	Fresh weight (g)	% Increase
Control	3,76 **c***	**-**
Bionur TD19 50kg	5,61 **b**	**33,0**
Bionur TD19 100kg	6,29 **a**	**40,3**
Bionur TD19 200kg	6,17 **a**	**39,0**

Treatments	Fresh weight (g)	% Increase
Control	3,76 **c***	**-**
B. subtilis 62,5g	4,65 **b**	**19,1**
B. subtilis 125g	5,08 **b**	**25,9**
B. subtilis 250g	7,33 **a**	**48,7**

*Means within the column following different letters are significant according to Fisher's LSD test (P= 0.05)

THE EFFECT OF BIOPREPARATIONS ON DRY WEIGHT OF *LOLIUM PERENNE*

Treatments	Dry weight (g)	% Increase
Control	0,45 **d***	**-**
Bionur 300cc	0,98 **c**	**54,2**
Bionur 600cc	1,18 **b**	**61,8**
Bionur 1200cc	1,35 **a**	**66,7**

Treatments	Dry weight (g)	% Increase
Control	0,45 **d***	**-**
Akvasis 100cc	0,81 **c**	**44,4**
Akvasis 200cc	1,02 **b**	**55,7**
Alvasis 400cc	1,11 **a**	**59,3**

Treatments	Dry weight (g)	% Increase
Control	0,45 **c***	**-**
Bionur TD19 50kg	0,63 **b**	**28,4**
Bionur TD19 100kg	0,73 **a**	**38,4**
Bionur TD19 200kg	0,84 **a**	**46,3**

Treatments	Dry weight (g)	% Increase
Control	0,45 **c***	**-**
B. Subtilis 62,5 g	0,55 **b**	**18,4**
B. subtilis 125 g	0,63 **b**	**28,2**
B. subtilis 250 g	0,91**a**	**50,4**

*Means within the column following different letters are significant according to Fisher's LSD test (P= 0.05)

Images from the some treatments of the experiment

FUSARIUM INOCULATED PLANTS

RHIZOCTONIA INOCULATED PLANTS

BIONUR DOSE 1

Bionur Dose 1 + Rhizoctonia

Bionur Dose 2

Bionur Dose 2 + Rhizoctonia

Bionur Dose 3

Bionur Dose 3 + Rhizoctonia

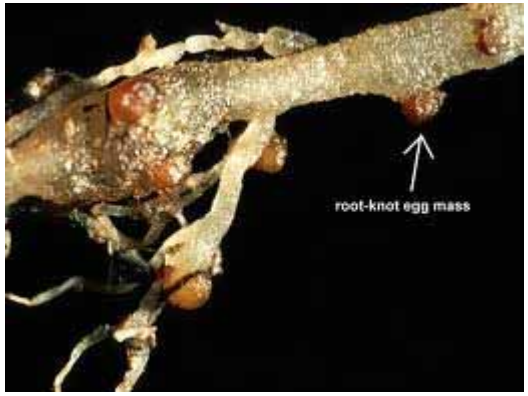
Objective 3

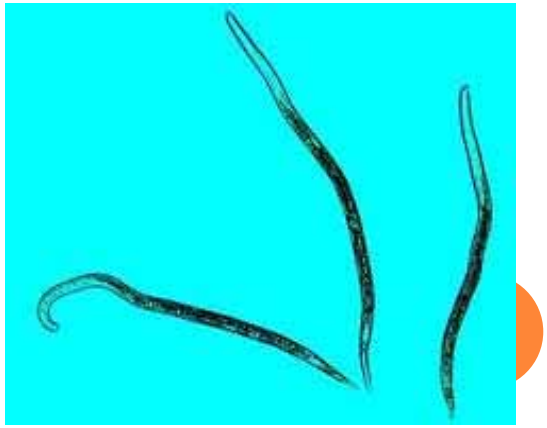
Suppressive effects of Bionur and Akvasis including Thiobacillus bacteria to Root-knot nematode on tomatoes

Dr. Mehmet Ali SÖĞÜT
M.Sc. Fatma Gül GÖZE

ROOT-KNOT NEMATODE

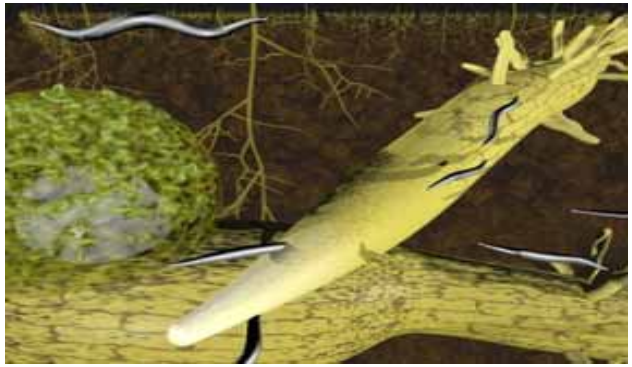
- *Meloidogyne incognita, M. javanica and M. arenaria* are the most common and economically important Root-knot nematode species in the world and also in Turkey,
- They cause aproximately five percent yield loss of total crop production in the world. The cost of yield losses is about 5 billion dollars annually (Oka et al., 2000).



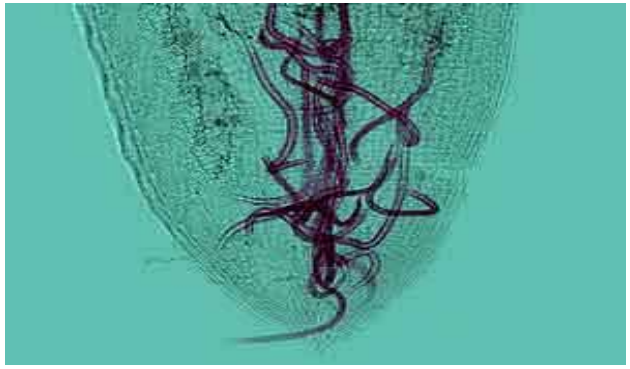


Root-knot nematode damage

- Root-knot nematodes feed on root cells as sedentary endoparasites and cause root cell deformation
- Plant roots injured by nematodes are susceptible to soil borne pathogens,
- and increased crop losses occur due to resulting disease complexes.







The objective of this study is to

a - investigate the suppressive effects of Bionur and Akvasis İncluding *Thiobacillus* spp. (S Bacteria) on root – knot Nematodes in tomatoes under controlled conditions

b – reveal the effects of different dosages of Bionur and Akvasis (commercial compounds).

Material and Methods

Experiments were conducted under controlled conditions at 24±1 ^{0}C and were arranged in a randomized block design with five replicates. This assay was repeated twice.
Sandy soil mixture and 250 ml plastic pots were used in the experiment

Plant Material for experiment:

Susceptible S. lycopersicon cvs. Rio Grande was used in the experiment

Root knot nematode inoculation:

Southern root-knot nematode (*Meloidogyne incognita*) inoculated to tomato seedling with juveniles between 2000 – 4000 in the experiment

Treatment time

Bionur and Akvasis were applied at different times

A: Bionur and Akvasis application three days before the seedlings were transplanted
B: Plant seedling along with the Bionur and Akvasis application
C: Bionur and Akvasis application three days after the seedlings were transplanted

Harvest

Experiments ended 8 weeks after root-knot nematode inoculation.
Plants removed from pots and the root system carefully washed under tap water.

Evaluation

Root galling induced by root-knot nematode was evaluated according to the 0 – 10 scale of root galling index referenced by Zeck (1978).

0 – 10 Scale for evaluation root galling (Zeck, 1971)

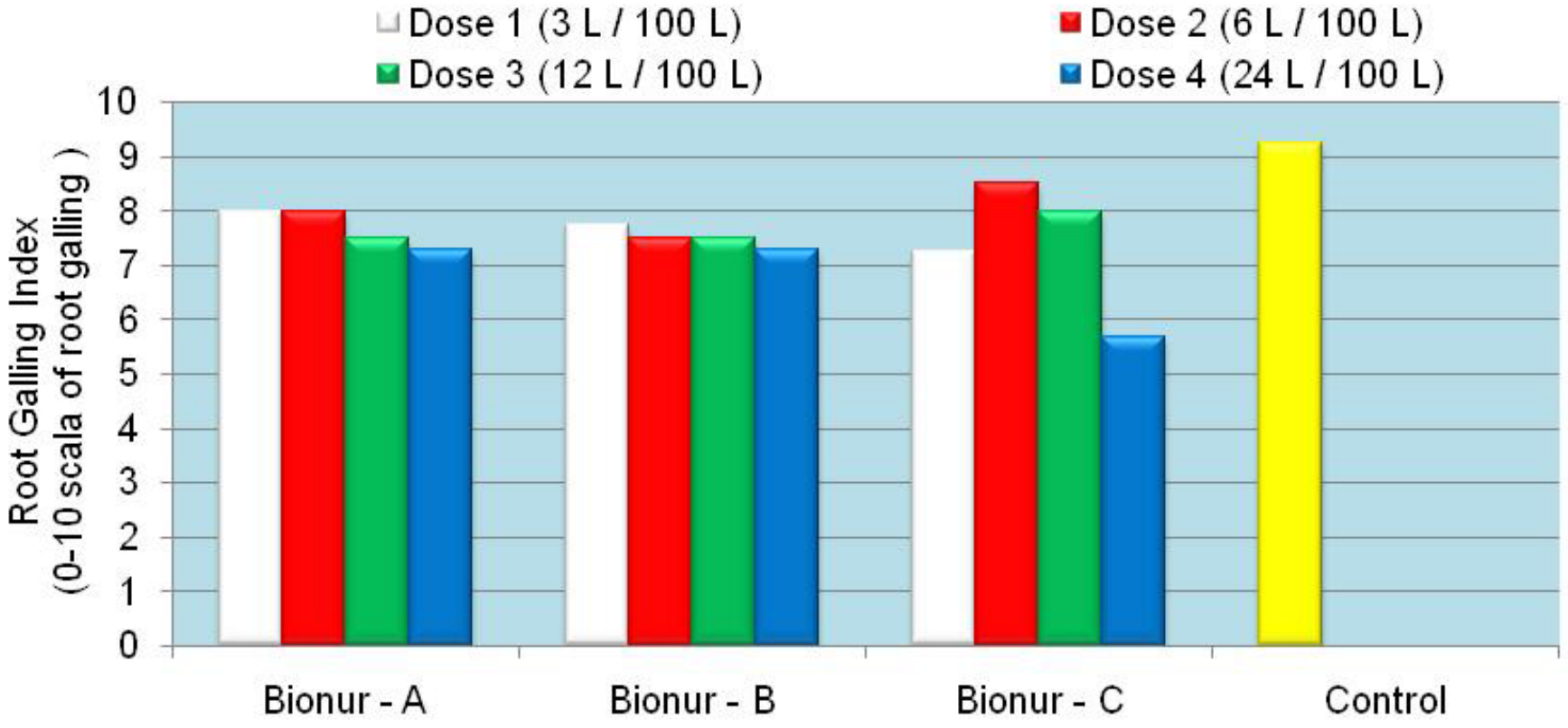
0 : Complete and healthy root system: No infestation
1 : Very few small galls can only be detected upon close examination
2 : Small galls as in “1” but more numerous and easy to detect
3 : Numerous small galls, some grown together, function of roots not seriously affected
4 : Numerous small galls, some big galls, majority of roots still functioning
5 : 25 % of root system, severely galled and not functioning
6 : 50 % of root system, severely galled and not functioning
7 : 75 % of root system, severely galled and lost for production
8 : No healty roots, nourishment of plant interrupted, plant still green
9 : The completely galled root system is rotting, plant is dying
10: Plant and roots are dead

Plant growth parameters

Plant height, fresh plant weight and root length were recorded in all treatments.

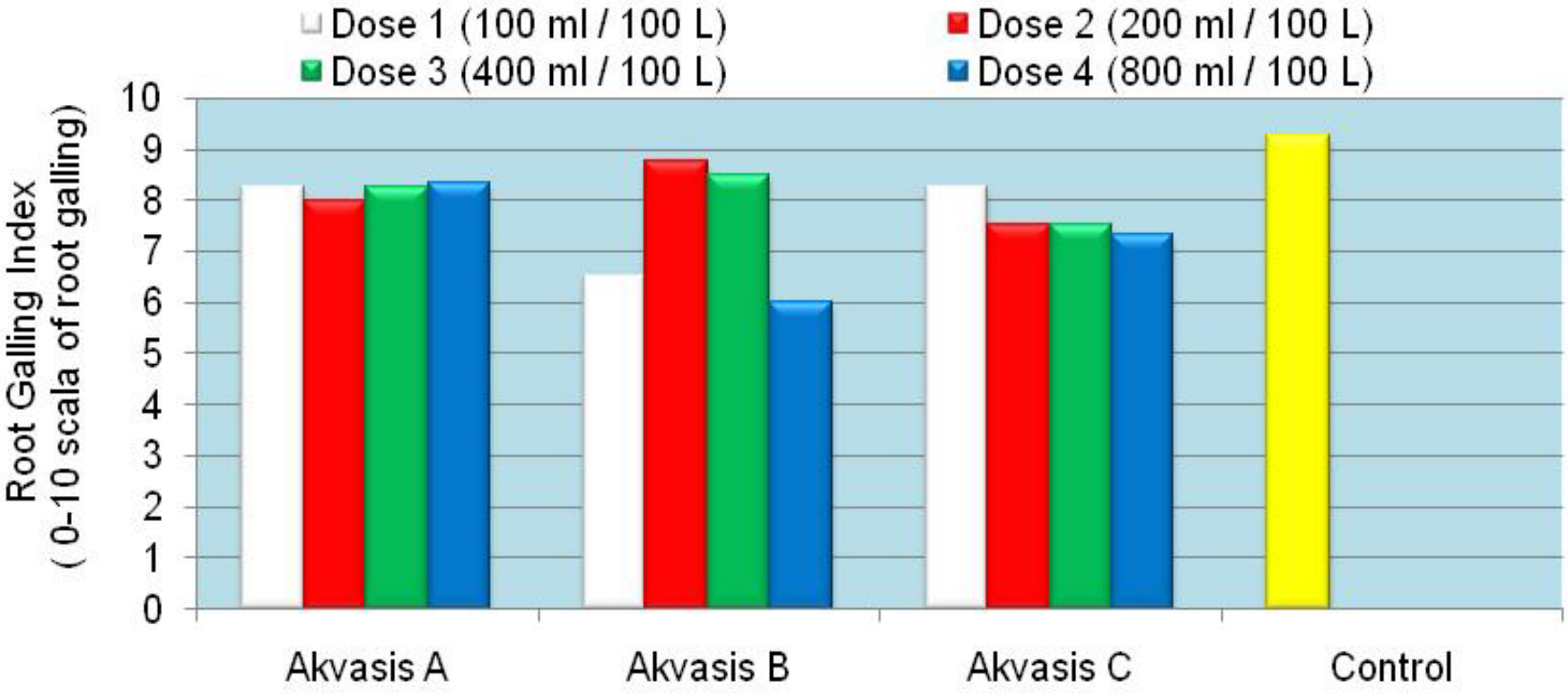
RESULTS

Effects of different dosages and different application times of Bionur on root galling indices in tomato roots



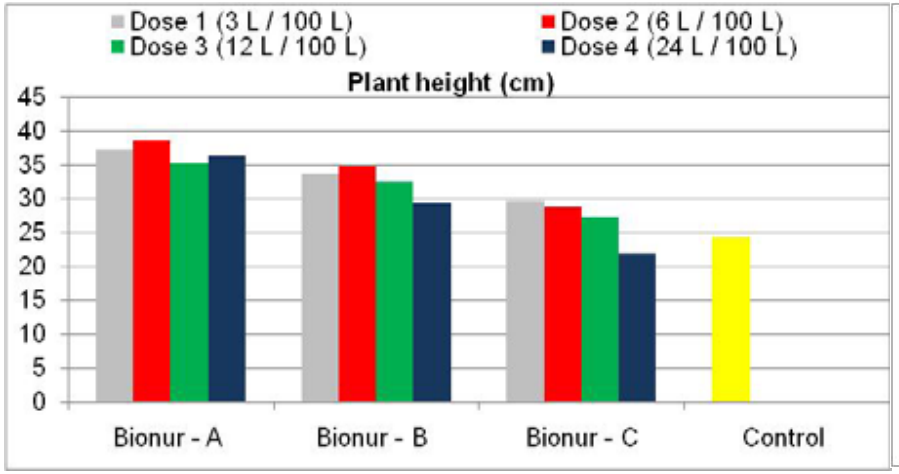
A: Bionur application three days before the seedlings were transplanted
B: Plant seedling along with the Bionur application
C: Bionur application three days after the seedlings were transplanted

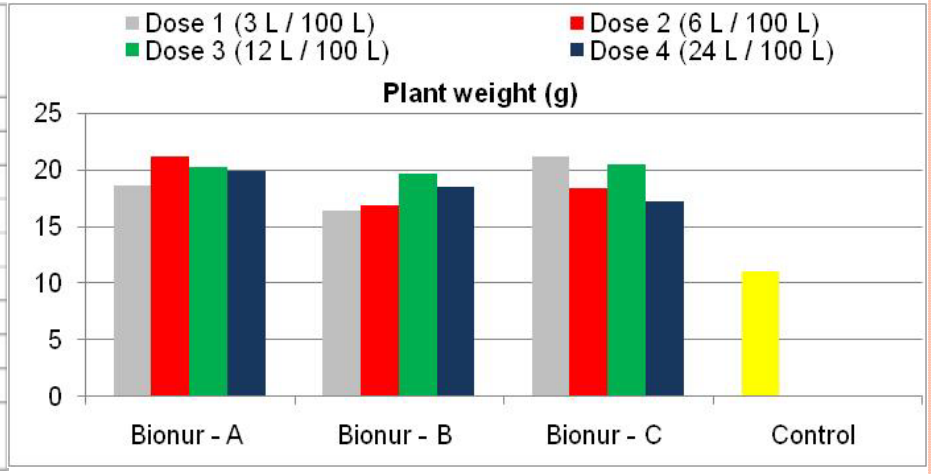
Effects of different dosages and different application times of Akvasis on root galling indices in tomato roots

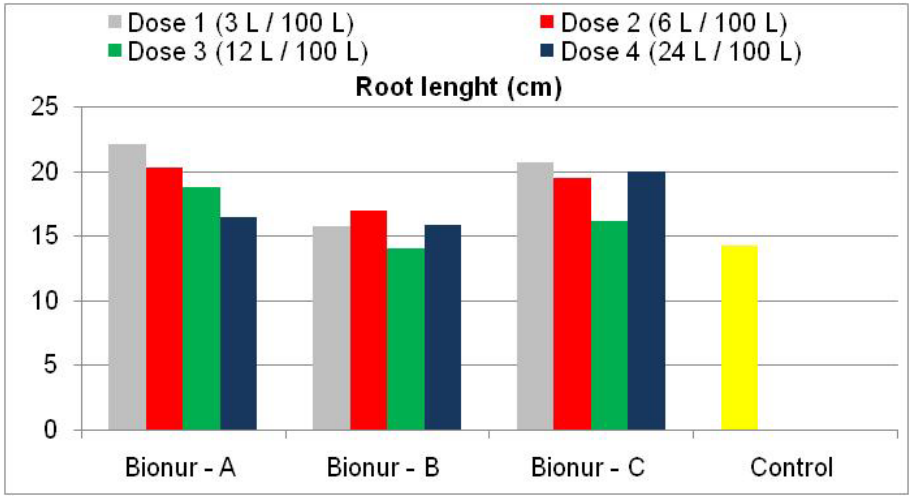


A: Akvasis application three days before the seedlings were transplanted
B: Plant seedling along with the Akvasis application
C: Akvasis application three days after the seedlings were transplanted

Effects of different dosages and different application times of Bionur on plant growth parameters

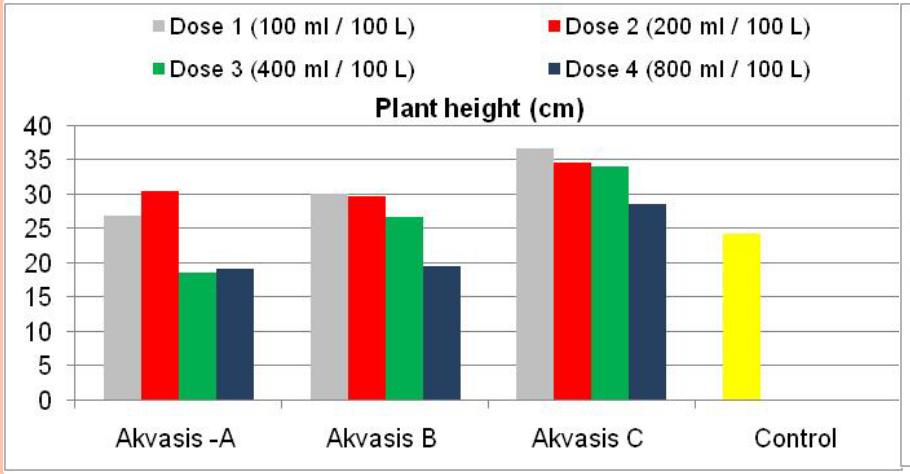


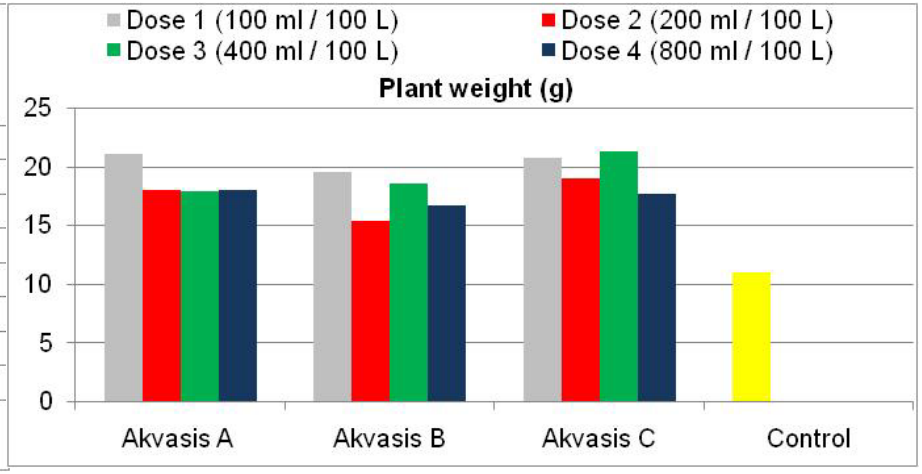


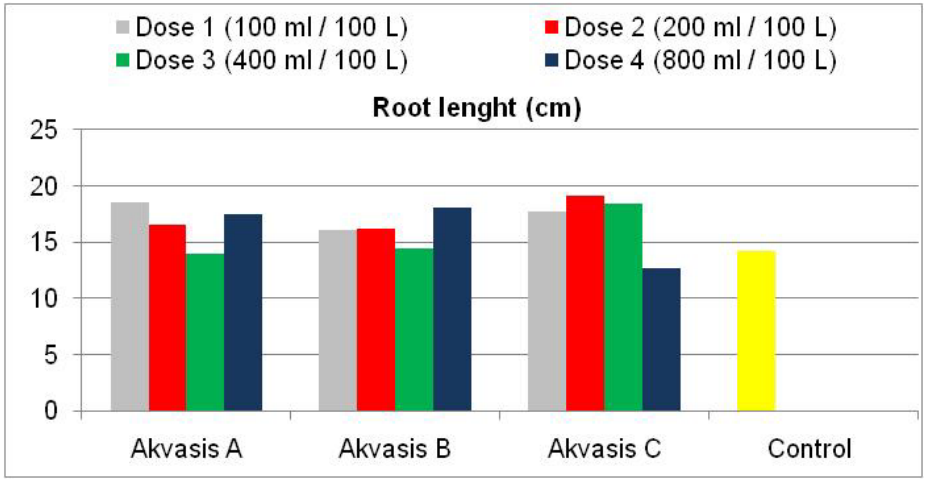


A: Bionur application three days before the seedlings were transplanted
B: Plant seedling along with the Bionur application
C: Bionur application three days after the seedlings were transplanted

Effects of different dosages and different application times of Akvasis on plant growth parameters







A: Akvasis application three days before the seedlings were transplanted
B: Plant seedling along with the Akvasis application
C: Akvasis application three days after the seedlings were transplanted

Conclusion 1; effect of some biological preparations against root rot diseases in tomatoes caused by *Fusarium oxysporum* f.sp. *radicis-lycopersici* and *Pythium deliense*

- Data showed that microbial Bionur, Akvasis and Bionur TD 19 agents could be effective in reducing root rot diseases caused by both of pathogens in tomatoes.

- Compared to the controls, significant decreases in disease severity were obtained with treatments of microbial Bionur and Bionur TD19

- Akvasis and *B. subtilis* had a lesser effect than microbial Bionur and Bionur TD19

Conclusion 2; effects of some biopreparations on root rot fungal diseases caused by *Fusarium graminearum* and *Rhizoctonia cerealis* on Turfgrass

- Microbial Bionur, Akvasis, Bionur TD 19 and *B. substilis* were effective with increasing doses,
- Microbial Bionur and Akvasis were the most effective biopreparations in controlling both Fusarium and Rhizoctonia diseases on Turfgrass
- Microbial Bionur and Akvasis had the highest fresh weight and dry weight of Turfgrass
- Microbial Bionur increased the density and intensity of Turfgrass by 70%

Conclusion 3; suppressive effects of Bionur and Akvasis on root-knot nematode in tomatoes

- It was observed that Microbial Bionur and Akvasis had a greater effect than the untreated control in suppressing root-knot nematodes in tomatoes compared to control plants,

- Dosage and application times of Microbial Bionur and Akvasis caused no significant differences in the experiment,

- Plant height, fresh plant weight and root length in Microbial Bionur and Akvasis were higher than untreated control plants,

- A second experiment using microbial Bionur and Akvasis using different applications, is currently being carried out under controlled conditions .

Thank you for your attention…

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