

()

Streptomyces

//

Fusarium oxysporum

Streptomyces

f.sp.melonis

Streptomyces

Streptomyces

%

%

Streptomyces

%

Streptomyces

($p < 0.01$)

%

Streptomyces

%

Streptomyces

($p < 0.01$)

%

%

/

Streptomyces

Fusarium oxysporum f.sp. melonis, Streptomyces:

Streptomyces

Fusarium oxysporum Schlechtend: Fr. f.

sp. melonis (Lach & Currence) W. C. Snyder & H.

N. Hansen

()

Streptomyces

()

()

Fusarium oxysporum f. sp. lycopersici

Pythium P. parasitica Phytophthora cinnamomi

Sclerotium rolfsii ultimum

()

Streptomyces *Streptomyces* ()
Streptomyces *F.oxysporum* f. sp. *narcisi*
 ()
 (F.O.M) *Streptomyces* *S.corchorusii* *Streptomyces mutabilis*

Streptomyces *F.oxysporum* f. sp. *lycopersici*

Streptomyces
 ()
 (CGM) Casein Glycerol Medium
 /
 / $MgSO_4 \cdot 7H_2O$ / K_2PO_4
 / $FeSO_4 \cdot 7H_2O$ /
 ()

Streptomyces *Streptomyces*
F. oxysporum (F.O.M)
 f. sp. *melonis*

 S1IC S1IB S2VF S1ID *Streptomyces*
 SE S3NA S3B S1IA
 ()

Phytophthora drechsleri
 ()
 A20 A24, A15 STL, A13

 () $Arc\sin\sqrt{x}$
 MSTATC

 ()

Streptomyces

Streptomyces

Streptomyces

CGM

Streptomyces

()

()

CGM

°C

()

() *Streptomyces*

Streptomyces

()

PDA

()

Streptomyces

()

Streptomyces

Streptomyces

S3B S3NA S2VF

) *Streptomyces*

STL A15 A24 A20 S11A S11B S11D S11C

SE A13

Streptomyces

CGM

Streptomyces

(.)

) *F. oxysporum* f. sp. *melonis*

(.)

(

)

(
)

(
)

Streptomyces + *F. oxysporum* f. sp. *melonis*

) *F. oxysporum* f. sp. *melonis*

(

) *Streptomyces*

(

(

+

)

x / x

(

)

Streptomyces + *F.oxysporum* f. sp. *melonis*

(

) *Streptomyces*

(

ArcSin√x

(.)

MSTATC

Streptomyces

√X + 0.5

(.)

Streptomyces

Streptomyces

Streptomyces

Streptomyces

S11D
A24

GNA
K₂S₂O₅

L ()

A24,S₂VF,A20,STL,S3B FOM

() CFU

()

Streptomyces

F.oxysporum f.sp. *melonis*

() *Streptomyces*

GNA

CFU

Streptomyces

S11D	/ a	/ ab
S11A	/ ab	/ abc
STL	/ ab	/ a
A15	/ bc	/ cde
S11B	/ bcd	/ abcd
A20	/ bcd	/ bcd
S11C	/ cd	/ fgh
A13	/ cd	/ fgh
S3B	/ cd	/ efg
A24	/ cd	/ h
S2VF	/ d	/ gh
S3NA	/ d	/ h

Streptomyces

CFU

CGM

Streptomyces

Streptomyces

S11A, S11D

STL

$$= n \quad n=(a- b)/a \times 100$$

$$= b \quad = a$$

FOM

Sreptomycetes

/

p<0.01

()

Streptomyces

Streptomyces

/

Streptomyces

Streptomyces

()

Streptomyces

()

	()	()	()	
Streptomyces	/ a	/ a	a	a
Streptomyces+	a	/ a	b	/ b
FOM	/ a	/ a	/ ab	
	/ a	/ ab	/ ab	a
	b	b	c	c

$$=n \quad : n=(a-b)/a \times 100$$

$$=b \quad =a$$

p<0.01

Streptomyces

()

	()	()	()	
Streptomyces	/ a	/ a	/ a	a
Streptomyces	/ a	/ bc	b	/ a
+ FOM	/ a	/ ab	/ ab	a
	/ a	/ ab	/ b	a
	b	b	c	c

(p<0.01)

Streptomyces

Streptomyces

FOM

Streptomyces

/

()

Streptomyces

()

()

FOM

Streptomyces

S11D	/ a	/ a	/ ab	/ a
S11C	/ a	/ ab	/ ab	/ a
S11A	/ a	/ b	/ b	/ a
S11B	/ a	/ ab	/ a	/ a
SE	/ b	/ c	/ c	/ b
A15	/ b	/ d	/ d	/ b
S2VF	/ c	/ e	/ e	/ c
A20	/ c	/ d	/ ef	/ e
STL	/ d	/ f	/ ef	/ d
S3B	/ d	/ f	/ ef	/ c
A24	/ e	/ g	/ g	/ c

$$= n$$

$$= b$$

$$n=(a-b)/a \times 100$$

$$= a$$

p<0.01

()

Streptomyces

... Streptomyces :

(CFU)

	<i>Streptomyces</i>	FOM	<i>Streptomyces</i>	FOM	<i>Streptomyces</i>	FOM
<i>Streptomyces</i> +FOM	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×
<i>Streptomyces</i>	(/ ± /)×		(/ ± /)×		(/ ± /)×	
		(/ ± /)×		(/ ± /)×		(/ ± /)×

FOM= *F. oxysporum* f. sp. *Melonis*

= ±

(CFU)

	<i>Streptomyces</i>	FOM	<i>Streptomyces</i>	FOM	<i>Streptomyces</i>	FOM
<i>Streptomyces</i> +FOM	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×	(/ ± /)×
<i>Streptomyces</i>	(/ ± /)×		(/ ± /)×			
		(/ ± /)×		(/ ± /)×		(/ ± /)×

FOM= *F. oxysporum* f. sp. *Melonis*

= ±

FOM

/ S3NA

Streptomyces

Streptomyces (CFU)

FOM STL

(/ ± /) ×

/

/ ×

CFU/g

Streptomyces

FOM

Streptomyces

()

Streptomyces

Streptomyces

FOM

()

Streptomyces

Streptomyces

/

S11D

(Dual culture)

FOM

Streptomyces / *Streptomyces*
Streptomyces
Streptomyces
 ()
Streptomyces
 ()
 (indole-3-acetic acid)
Streptomyces sp
 ()
Pythium *Streptomyces*
aphanidermatum
Streptomyces
Sclerotium rolfsii *Streptomyces*
 ()
 ()
Streptomyces
Sclerotinia minor
 β -(1,3)-glucanase
Streptomyces
 ()
Streptomyces sp
Streptomyces
 ()
 ()
Streptomyces
 ()
 ()
 oat meal broth *Streptomyces*
 ()
 ()
Streptomyces

Streptomyces

drechsleri

Streptomyces

()

Soil solarization

Cucumis melo

()

Streptomyces

()

Phytophthora Marcophomina phaseoli

REFERENCES

)

)

Fusarium oxysporum f.sp. *melois*

:

Streptomyces

(*Phytophthora drechsleri*)

6. Baker, R. 1968. Mechanism of biological control of soil-born pathogens. Annual Review of Phytopathology, 6:263-294.
7. Berg, G., P. Marten, A. Minkwitz, & S. Bruckner 2001. Efficient biological control of fungal plant diseases by *Streptomyces* sp. DSMZ 12424. Zeitschrift für pflanzenkrankheiten und pflanzenschutz, 108(1):1-10.
8. Bolton, A. T. 1980. Control of *Pythium aphanidermatum* in poinsettia in a soilless culture by *Trichoderma viride* and a *Streptomyces* sp. Canadian Journal of Plant Pathology 2:93-95.
9. Brodbent, K. F., K. F. Baker, & Y. Waterworth. 1971. Bacteria and actinomycetes antagonistic to fungal root pathogen in Australian soils. Australian Journal of Biological Science 24: 925-944.
10. Burton, R. J. & J.R. Coley – Smith. 1993. Production and leakage of antibiotics by *Rhizoctonia cerealis*, *R. oryzae-sativae* and *R.tuliparum*. Mycological Research, 97:86-90.
11. Cook, R. J. & K.F.Baker .1983. The Nature and Practice of Biological Control of Plant Pathogens. The American Phytopathological Society. St. Paul, Minnesota, 539 PP.
12. Dennis, C. & J.Webster. 1971a. Antagonistic properties of species-groups of *Trichoderma*. I. Production of non-volatile antibiotics. Trans. Brit. Mycol. Soc. 57:25-39.
13. Dennis, C. & J.Webster 1971b. Antagonistic properties of species-groups of *Trichoderma*. II. Production of volatile antibiotics. Trans. Brit. Mycol. Soc, 57:41-48.
14. Dhingra, D. O. & J.B. Sinclair. 1995. Basic Plant Pathology Methods. Second edition., Lewis Publishers, Boca Raton, London, 435 PP.
15. El-Abyad, M. S., M. A. EL-Sayed, A. R. El-Shansoury & N.H. El-Batanouny. 1993. Inhibition effect of UV mutants of *Streptomyces corchorusii* and *Streptomyces spiroverticillatus* on bean and banana wilt Pathogens. Canadian Journal of Botany 71:1080-1086.
16. El-Shahed, K.Y.I. 1994. Production of antifungal antibiotics "Polyoxins" by *Streptomyces cacaoi* var. *asoensis* NRC-19. Egyptian Journal of Microbiology. 29:315-328.
17. El-Shanshoury, A. R.1989. Growth promotion of wheat seedling by *Streptomyces atroolivaceus*. Journal of Agronomy and Crop Science, 163:109-114(cited from CAB abstracts).
18. El-Tarabily, K. A., M. H. Soliman, A. H. Nassar, H. A. Alhassani, K. Sivasitamparam, K. Mckenna & G.F. Hary. 2000. Biological control of *Sclerotinia minor* using chitinolytic bacterium and actinomycetes. Plant pathology, 49:573-583.
19. Elsign, J. C. 1991. Introduction to the *Actinomycetes* spp. 811-815. In: Balows, A., Truper, H. G., Dworkin, M., Harder, W., & Schleifer, K. H. (eds). The Prokaryotes, a Handbook on the Biology of Bacteria Ecophysiology, Isolation, Identification, Applications, 2nd ed. Volume 1. Springer-Verlag, Berlin.
20. Etebarian, H. R., E. S. Scott, & T. J. Wicks. 2003. Evaluation of *Streptomyces* strains as potential biological agent of *Phytophthora erythroseptica* Iran. J. Plant path. 39:49-63.
21. Etebarian, H. R. 2002. Evaluation of *Streptomyces* isolates for biological control of charcoal rot of melon. Abstract of 26th International Horticultural Congress (supplement) Toronto, Canada, 11P.
22. Hiltunen, L. H., C. A. Linfield, & J.G. White. 1995. The Potential for the biological control of basal rot of Narcissus by *Streptomyces* sp. Crop-Protection. 14(7):539-542.
23. Hsu, S. C. & J. L.Lockwood . 1969. Mechanism of inhibition of fungi in agar by *Streptomyces* , Journal of General Microbiology 57: 149-158.
24. Jackson, A. M., J. M. Whipps, & J. M. Lynch. 1991. In Vitro Screening for identification of potential biocontrol agent of Allium white rot. Mycological Research, 95:430-434.
25. Jefferys, E. G .1952. The Stability of antibiotics in soil. Journal of General Microbiology, 7:295-312.

26. Jones, C. R. & D.A. Samac. 1996. Biological control of fungi causing alfalfa seedling damping-off with a disease-suppressive strain of *Streptomyces*. *Biological Control*, 7: 196-204.
27. Kuster, E. & S. T. Williams. 1964. Selection of media for isolation of *Streptomyces*. *Nature*, 209: 928-929.
28. Lacey, J. 1973. Actinomycetes in Soils, Compost and fodders. In: Actinomycetales: Characteristics and Practical Importance (Ed G Sykes and F A Skinner) Academic Press. London PP: 231-252.
29. Little, T. M. & F.J. Hills. 1978. *Agricultural Experimentation Design and Analysis*. John Willey and Sons, Inc. New York, USA. 349 PP.
30. Liu, D., N. A. Anderson, & L. L. Kinkel . 1995. Biological control of potato scab in field with antagonistic *Streptomyces scabies*. *Phytopathology*, 85:827-831.
31. Lockwood, J. L. 1959. *Streptomyces* spp. as a cause of natural fungitoxicity in soils. *Phytopathology*, 49: 327-331.
32. Nair, M. G., A. R. Putnam, S. K. Mishro, M. H. Mulks., W. H. Taff., & J.E. Keller .1989. Faerifungin: a new broad-spectrum antibiotic from *Streptomyces griseus* var. *autotrophicus*. *Journal of Natural Products*, 52:797-809.
33. Nair, M. G., A. Amitabh, D. L. Thorogood, & A. Chandra .1994. Gopalamicin, an antifungal macrodiolide produced by soil actinomycetes. *Journal of Agriculture and Food Chemistry*, 42:2308-2310.
34. Na Lampang, A. 1994. Study on Interactions between *Sclerotium rolfsii* Sacc. and selected antagonists (PhD Thesis) University of Adelaide, South Australia.
35. Rothrock, C. & D. Gottlieb. 1981. Importance of antibiotic production in antagonism of selected *Streptomyces* species to two soil-born plant pathogen. *The Journal of Antibiotics*, 34:830-835.
36. Rose, S. L., C. Y. Li, & A. S. Hutchins. 1980. A *Streptomyces* antagonist to *phellinus weirii*, *Fomes annosus* and *Phytophthora cinnamomi*. *Canadian Journal Microbiology*, 26:583-587.
37. Sherf, A. F. & A. A. Macnab .1986. *Vegetable Disease and Their Control*, 3rd ed., A Wiley Intrescience Publication, John Wiley & Sons, New York, 728 PP.
38. Skinner, F. A. 1956. Inhibition of the growth of fungi by *Streptomyces* spp. In relation to nutrient conditions. *Journal of General Microbiology*, 14:381-392.
39. Trenozhnikova, L P., L. A. Vetlungina, & K.A. Tulemisiva . 1989. Effect of small doses of anthracycline antibiotics on growth and development of agricultural plants. *Bulletin-OEPP*, 19:42-46.
40. Williams, S. T., M. Shaemullah, E. T. Watson, & C. I. Mayfied. 1972. Studies on the ecology of Actinomycetes in soil. V. the influence of moisture tension on growth and survival. *Soil Biology and Biochemistry* 4:215-225.
41. Wong, P. T. W. & D. M. Griffin. 1974. Effect of osmotic potential *Streptomyces* growth, antibiotic production and antagonism to fungi. *Soil biology and biochemistry*, 6:319-325.
42. Yuen, G. Y., M. N. Schroth, & A. H. McCain. 1985. Reduction of fusarium wilt of carnation wilt suppressive soils and antagonistic bacteria. *Plant Disease*, 69:1071-1075.