doi: https://doi.org/10.15407/microbiolj81.01.009

UDC 579.87, 632.4, 632.9, 579.222

RESEARCH ON *STREPTOMYCETES* FROM MOLDOVIAN SOILS WITH ANTIFUNGAL, NEMATICIDAL AND PHYTOSTIMULATING ACTIVITY ON TOMATO

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Aim. *The purpose of the research was to determine the antifungal, nematicidal and phytostimulating activity of streptomycetes isolated from the soil of Moldova.* ***Methods.*** *The strains were stored on the media Czapek and oatmeal agar by subculturing. Antifungal activity was determined by disk diffusion method, using phytopathogenic fungi as test cultures. To determine the nematicidal and phytostimulating activity of exometabolites of the studied strains, they were cultivated on complex medium M-I and aqueous solutions of exometabolites (EM) were prepared that were contained in the liquid culture after it was separated from the biomass by centrifugation. Tomato seeds were treated by soaking in EM solutions and the germination and length of the roots were determined. Nematicidal activity was determined by mortality test.* ***Results.*** *Strains that completely inhibited the growth of A. alternata, B. cinerea and S. solani (S. sp. 9, 10 and 17) or retarded the growth of test cultures to different degrees (zone diameters from 25.0 to 34.0 mm) were found. For nematicidal activity, the best results were shown by EM strains of S. spp. 9 and 205. The best results on the germination of tomato seeds of the cv. Fakel were obtained by treating with a 0.5% solution of EM strains of S. spp. 49 and 154 (by 11.32% more than in control), and for root growth – of EM of all strains (73-89% more than in control).* ***Conclusions.*** *Studies have shown that the EM of streptomycetes isolated from the soil of Moldova can be used to obtain new plant growth stimulants and biopesticides.*

Keywords: Streptomyces, phytopathogens, antifungal and nematicidal activities, phytostimulation.

In developing countries nutritional shortages are caused by numerous factors including crop yield losses due to diseases caused by pathogens and parasites (fungi, bacteria, viruses, plant parasitic nematodes and insects). Generally, plant protection against these pests is based on the use of chemicals. The intensive use of pesticides leads to environmental pollution with serious consequence for the human and animal health. Therefore, the European Legislation has deeply revised and restricted the use of pesticides on agricultural crops focusing the attention on the use of alternative control measures based on natural substances (essential oils or biocidal plants), agronomic strategies (green manures, soil amendments, crop rotations, biofumigations), physic methods (soil solarization, ozone treatments) and biological control agents (mainly fungi and bacteria) that could be used in organic agriculture.

Among these alternative control measures particularly interesting is the use of antagonist microorganisms or their metabolites for the low environmental impact and cost production. At the present time, a number of microorganisms having an antagonistic effect on phytopathogens have been described. The mechanism of their action includes competition for nutrition, colonization of the rhizosphere and leaf surfaces and synthesis of antibiotic substances [1].

Today in microbiology the purpose is to obtain environmentally friendly microorganisms of practical importance for crop protection and production, livestock, storage and processing of agricultural products [2].

Actinomycetes are a group of bacteria, many of which are known for their ability to synthesize biologically active substances. The metabolites produced by actinomycetes can improve plant growth and resistance to phytopathogens and parasites. A considerable number of studies clearly demonstrate the success of the use in agriculture of some types of actinomycetes, which indicates the relevance and research prospects in this direction [3-8].

Most actinomycetes are soil microorganisms. Actinomycetes are a constant component of soil and rhizosphere microbial communities. Like all other elements of the soil, they enter in relationship with surrounding organisms, including plants. Actinomycetes play an important role in the development of plants, participating in the supply of the last elements of nutrition, phytohormones, vitamins and other growth factors [6, 9-11].

An objective evaluation of the effectiveness of the use of actinomycetes as sources of growth stimulating substances has been obtained from numerous studies. The stimulating effect of the liquid culture of actinomycetes and antibiotics isolated from them has been tested in laboratory experiments and confirmed in field trials.

Streptomycetes during their life cycle produce a wide range of biologically active substances such as vitamins, antibiotics, amino acids, enzymes, hormones, lipids, of fundamental importance in pharmaceuticals, cosmetics, agriculture and nutrition [12, 13]. *Streptomyces* are an inexhaustible source of antibiotics and they produce over 75% of known antibiotic substances. *Streptomyces* EMs are important in agriculture because they are used as bactericides, fungicides, insecticides, plant growth stimulants and herbicides. Therefore, *Streptomyces* can be used as effective biological agents in the control of many plant diseases [10, 14].

Among the exometabolites produced by streptomycetes, only a small amount has antiparasitic effect. According to the online edition of the Journal Antibiotics (Japan) (1122), over the past 50 years, 35 species of streptomycetes, producers of antiparasitic substances, have been discovered. The research in this field is actively continuing. Recently, spinosyne substances produced by *Saccharopolyspora spinosa* (1106) have been discovered, with selective insecticidal activity against scaly-tailed flies, thrips, flies, and the Colorado potato beetle. Among the antibiotics with antiparasitic action, avermectin, produced by the streptomycete *Streptomyces avermetilis* MA-4680 isolated from the soil of Japan, deserves attention. It has been shown that avermectin does not show antibacterial and antifungal activity, although it can be a precursor of another important antibiotic, oligomycin, having fungicidal activity [15].

Over 50% of streptomycin antibiotics have found practical applications in human and veterinary medicine, agriculture and industry [16].

Another aspect of increasing interest for *Streptomyces* is their ability to synthesize phytohormones that are able to stimulate crops growth and development increasing yield at harvest. Remarkable is the fact that the final products are environmentally friendly and safe for consumption. Experiments have been carried out on tomatoes, soybeans, sugar beet, tobacco, corn, etc. Metabolites of the used strains of genus *Streptomyces* have influenced differently the crops, depending on the strain specificity and the concentration used. Moreover, a positive influence could be also observed in an increasing of percentage of germinated seeds, root length and yield at harvest [17].

Genus *Streptomyces* is the most numerous group among actinomycetes producing substances of various classes of chemical compounds with biological activity against plant parasitic nematodes [18-20]. Among plant parasitic nematodes the genus *Meloidogyne* spp. is a very important harmful pest because widespread and poliphagous. This genus can cause severe yield losses and the use of bacteria exometabolites is a clever and promising approach for their control.

During phytopathogenic monitoring and phytosanitary controls in the Republic of Moldova were revealed on different crops symptoms of root rot caused by *Pythium debaryanum*, *Rhizoctonia aderholdi*, *Erwinia* spp. (from 20 to 50 %), fusarium wilt caused by *Fusarium oxysporum, Stolbur nicotiana virus*, grey necroses by *Botrytis cinerea*, early blight by *Alternaria solani*, *Verticillium albo-atrium* and black necroses on top of fruits by *Diplodina destructive*.

The aim of this study was to verify i) the biological activity of some antibiotics of Moldavian streptomycetes strains against parasites and soil pathogens widespread in the Republic of Moldova and ii) the phytostimulating effect of exometabolites of *Streptomyces* on tomato seeds (cv. Fakel).

Material and methods. In different areas of Republic of Moldova soil samples were collected to isolate several streptomycetes strains. So, soil samples were collected from: i) field cultivated at corn since 1947 without using fertilizers, herbicides and pesticides, ii) Cornesti reserve and iii) Singera (Botanica zone, Chisinau Municipality) characterised by black earth polluted with pesticides. The studied *Streptomyces* strains were isolated on starch ammonia agar and maintained on media Czapek with glucose, oat agar and Gause [21].

To determine the antagonistic activities of these *Streptomyces* strains a method based on the ability of antibiotics to diffuse into an agar medium was used. The antibiotic substance synthesized by the studied organisms inhibits the growth of the test-cultures. According to the size of the growth inhibition zones, test cultures of the studied organisms were judged on the showed antibiotic activity [10].

In our experiments the following phytopathogenic fungi were used as test-cultures: *Alternaria alternata*; *Aspergillus flavus*; *Aspergillus niger*; *Botrytis cinerea*; *Fusarium solani*; *Fusarium oxysporum*; *Rhizoctonia solani*; *Sclerotinia sclerotiorum*.

The phytostimulating properties of the studied *Streptomyces* EMs strains were determined. Liquid cultures of the different *Streptomyces* strains were obtained after growth on the M-I complex medium for 5 days at 27ºC and separating off biomass by centrifugation.

Seeds of tomato of "Fakel" variety were soaked in the studied liquid cultures at 0.5 and 1.0 % concentrations and then kept in a thermostat for 4 days at 26 ºC. After exposition in the growth cabinet seed germination and root length were determined [22].

Mortality test. Cultural filtrates containing EMs were used at different dilutions in distilled water (100%, 50% and 25%) to assess their nematicidal effect on the root-knot nematode *Meloidogyne javanica*.

Second stage juveniles (J2) of *M. javanica* were extracted from plastic house nematode infested soils by the modified Baermann's method.

One hundred J2 were transferred into Petri dishes containing the different liquid cultures concentrations of the selected streptomycetes strains for different exposure times. Petri dishes were set up according to a completely randomised block design with three replications for each treatment. Petri dishes containing stock solutions and J2 were kept in dark condition at room temperature (25ºC). Nematode mobility was observed at 2, 4, 8, 12 and 48 hours, counting active, mobile and dead J2 by a stereomicroscope (at 20X magnification).

Results. The antifungal activity of *Streptomyces* strains isolated from Moldovian soils against a large number of phytopathogenic fungi widespread in Moldova is reported in Table 1. The ability of isolated strains to inhibit phytopatogens was based on the growth of pathogens on Petri dish. To this end, the studied *Streptomyces* strains of were grown by a "continuous lawn" on the agarized Czapek medium with glucose.

It was noted that strains *Streptomyces* spp. 205, 208, 216, 222, 229 and 233 (isolated from soil samples polluted with pesticides) inhibited the growth of test-cultures of only few phytopathogenes. In this group the absence or insignificant (up to 9.0–11.0 mm) growth inhibition zones was noted.

Strains of *Streptomyces* isolated from soil samples of monoculture-corn actively influenced inhibition of different pathogens. They completely suppressed the growth of *S. sclerotiorum* (*Streptomyces* sp. 9), *A. alternata* (*Streptomyces* spp. 10 and 33) and *B. cinerea* (*Streptomyces* spp. 10 and 17), or they caused the formation of antagonistic zones (29.0–34.0 mm) against *A. flavus*, *B. cinerea*, *F. oxysporum*, *F. solani* and *R. solani*.

Special attention should be reserved to strains *Streptomyces* spp. 9, 10 and 33. *Streptomyces* sp. 9 strain actively inhibits the growth of all pathogens (test-cultures) with the exception of *A. niger*. Strain *Streptomyces* sp. 10 – was effective to inhibit 5 of the 8 considered pathogens, and strain *Streptomyces* sp. 33, in addition to the complete growth suppression of *A. alternata*, actively inhibit growth of *B. cinerea* (zone up to 24.0 mm diameter).

Table 1

Antifungal activity of *Streptomycetes* strains isolated from soils of Moldova

Strain	Diameter of zones of growth inhibition, mm							
Streptomyces sp.	*A. alternata*	*A. flavus*	*A. niger*	*B. cinerea*	*F. oxysporum*	*F. solani*	*R. solani*	*S. sclerotiorum*
7	0	0	0	12.0±0.1	0	0	29.0±0.6	0
9	28.0±0.6	29.0±0.3	19.0±0.2	29.0±0.1	34.0±0.9	29.0±0.7	29.0±0.6	C.i.
10	C.i.	16.0±0.2	22.0±0.4	C.i.	0	14.0±0.1	-	-
11	14.0±0.2	11.0±0.1	11.0±0.1	0	0	12.0±0.1	0	0
17	25.0±0.3	-	23.0±0.7	C.i.	0	11.0±0.2	-	-
19	10.0±0.2	-	0	-	-	10.0±0.1	-	-
33	C.i.	0	0	24.0±1.3	0	0	0	0
36	14.0±0.3	0	12.0±0.2	17.0±0.5	17.5±0.4	16.5±0.4	-	-
47	11.0±0.5	25.0±0.8	29.0±0.7	11.0±0.1	15.0±0.2	14.0±0.3	0	28.0±1.1
76	17.0±0.3	0	0	13.5±0.2	9.0±0.1	14.0±0.1	10.0±0.1	16.5±0.5
154	0	0	0	-	9.0±0.2	12.0±0.1	10.0±0.4	0
178	0	0	0	16.0±0.3	20.0±0.5	14.0±0.2	0	14.0±0.2
198	17.5±1.2	0	11.0±0.3	15.0±0.2	14.0±0.1	16.0±0.2	0	16.0±0.3
205	0	0	0	0	9.0±0.1	13.0±0.1	0	0
208	0	0	10.0±0.3	0	0	11.0±0.1	0	0
216	0	0	0	11.0±0.2	-	0	0	9.0±0.2
222	0	0	12.0±0.1	9.0±0.1	0	0	0	0
229	0	0	0	10.0±0.3	9.0±0.1	10.0±0.2	0	0
233	9.0±0.1	0	0	10.0±0.1	0	9.5±0.1	9.0±0.1	0

Note: p=0.05

*C.i. – complete inhibition; - – experiment was not conducted.

Streptomyces strains isolated from the forest reserve soil were observed to differ in the antagonistic spectrum against the considered pathogens. So, for example, strain *Streptomyces* sp. 154 was no so much effective to control the pathogens. For this strain the antagonistic activity was weakly related to 3 of the 8 test-cultures (growth inhibition zones with diameter of 9.0–12.0 mm), whereas for strain *Streptomyces* sp. 198, the ability to delay the growth of 6 of the 8 test-cultures was observed (*A. alternata*, *A. niger*, *B. cinerea*, *F. solani*, *F. oxysporum, S. sclerotiorum*) with antagonistic zones varying from 11.0 to 17.5 mm diameter.

Long-term storage (10 years) by periodic subculturing led to significant reduction in the antifungal activity of the studied strains (Table 2). So, specific *in vitro* tests were carried out on the most effective *Streptomyces* strains and their results reported in Table 2.

Table 2

Antifungal activity of S*treptomycetes* strains after 10 years of storage by periodic subculturing

Strain	Growth inhibition zones diameter, mm				
Streptomyces sp.	*A. alternata*	*A. niger*	*B. cinerea*	*F. oxysporum*	*F. solani*
9	24.0±0.6	18.0±0.5	18.0±0.3	19.0±0.3	17.0±0.2
10	20.0±0.3	12.0±0.2	C.i.	0	10.0±0.1
11	11.0±0.1	11.0±0.1	0	0	12.0±0.1
19	10.0±0.1	0	0	0	11.0±0.4
33	28.0±0.7	0	20.0±0.4	0	0
36	10.0±0.1	14.0±0.2	14.0±0.7	15.0±0.4	15.0±0.2

Note: p=0.05

Antagonistic activity of strain *Streptomyces* sp. 9 decreased from 29.0 to 18.0 mm, from 34.0 to 19.0 mm and from 29.0 to 17.0 mm for *B. cinerea*, *F. oxysporum* and *F. solani*, respectively (Table 2).

Strain *Streptomyces* sp. 10 decreased antagonistic activity against *A. alternata* from complete inhibition to 20.0 mm and against *A. niger* from 22.0 to 12.0 mm.

Antagonistic activity against *A. alternata* decreased from complete inhibition to 28.0 mm for the strain *Streptomyces* sp. 33.

The storage in a lyophilized form of *S.* strains did not improve their antagonistic activity in comparison with the periodic subculturing.

Strains of *Streptomyces* spp. 9, 66 and 205 were also screened for their nematicidal activity against second stage juveniles (J_2) of the root-knot nematode *M. javanica*. EMs of selected strains at all tested concentrations (25, 50 and 100%) had no nematicidal effect on J_2 of *M. javanica* after 4 h exposure time (Table 3). EMs of strains *Streptomyces* spp. 205 and 9 had inhibitory effect only after 8, 12 and 24 hours at 100% concentration. At this concentration, all selected strains were not able to kill nematode J_2 (Table 3).

J_2 of *M. javanica* were inhibited in their mobility by the two bacteria strains at 12 h and 24 h at 100% and 50% concentrations, respectively. The test demonstrated potential nematicidal effect of *Streptomyces* sp. 205 and 9 EMs against root-knot nematodes.

Table 3

Effect of selected bacteria strains on the activity of the second stage juveniles of *Meloidogyne javanica*

Nr. of strains			
Time exposure	**100 % concentration**		
	***S.* sp. 66**	***S.* sp. 205**	***S.* sp. 9**
2h			
4h			
8h			
12h			
24h			
Time exposure	**50 % concentration**		
	***S.* sp. 66**	***S.* sp. 205**	***S.* sp. 9**
2h			
4h			
8h			
12h			
24h			
Time exposure	**25 % concentration**		
	***S.* sp. 66**	***S.* sp. 205**	***S.* sp. 9**
2h			
4h			
8h			
12h			
24h			

Note:AC – active (80-100% J_2 active) | **M – mobile (60-80% J_2 active)** | **SM 2 – semi mobile (40-60% J_2 active)** | **SM 1 – semi mobile (10-30% J_2 active)** | **D – death (J_2 dead)**

Other studies were carried out using liquid culture with *Streptomyces* EMs to verify their stimulating effect on tomato seed germination and root growth.

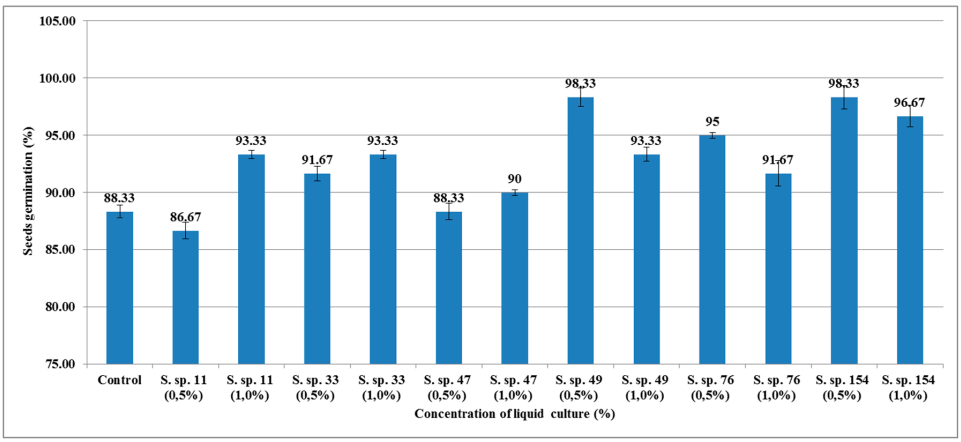
Six strains of streptomycetes were isolated from soils of the central part of R. Moldova and grown on a liquid organic medium M-I containing corn flour as main source of nitrogen and carbon to obtain their complex of EMs.

Tomato seeds germination changed according to the *Streptomyces* EM used (Fig. 1). So, *Streptomyces* sp. 47 EM, at both used concentrations of liquid culture (0.5 and 1%), had no effect on tomato seed germination with percentages at control level.

EMs of strains *Streptomyces* spp. 11 and 33, of liquid culture at 1% concentration showed higher percentages of seed germination than that observed at 0.5% concentration. The highest value of seed germination (98.33%) was observed using EMs of both *Streptomyces* sp. 49 and *S.* sp. 154 with seeds soaked in liquid culture in 0.5% concentration (11.32% more than the control). At 1% concentration, for the same strains, seed germination was 93.33 and 96.67%, respectively with a correspondent increase of 5.66% and 9.44% in comparison to the control).

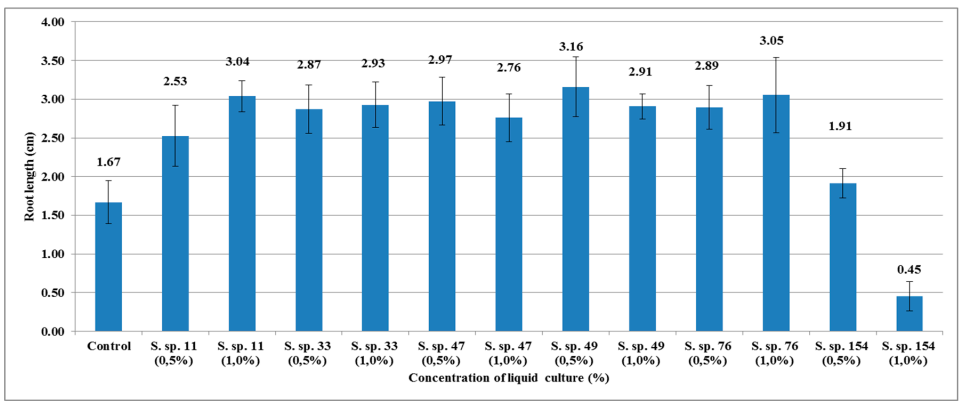
The effect of *Streptomyces* EMs on root length of germinated tomato seeds cv. Fakel is reported in Fig. 2. On the six EM tested strains, only five had positive effect on the development of rootlets. The highest root length was

obtained at 1% concentration of liquid culture of EMs of strains *Streptomyces* sp. 11 and sp. 76 and at 0.5% concentration of liquid culture of strain *Streptomyces* sp. 49.



Note: p=0.05

Fig. 1. Effect of liquid culture with streptomycetes EMs of different concentrations on percent germination of tomato seeds cv. Fakel



Note: p=0.05

Fig. 2. Root length of germinated tomato seeds cv. Fakel exposed to liquid culture at 0.5 and 1% concentrations with streptomycetes EMs

Tomato seeds soaked in EM solutions of *Streptomyces* sp. 11 at a concentration of 0.5% and 1.0%, increased the root length by 51.5% and 82% in comparison to the control, respectively. In comparison to the control, an increase of 73.1% and 82.6% in rootlets length was also observed in seed treatment with *Streptomyces* sp. 76 solutions of liquid culture at 0.5 and 1.0% concentration, respectively. For the same parameter, increase of 89.2% and 74.3% were observed in EM strain of *Streptomyces* sp. 49 at 0.5 and 1.0% concentration of liquid culture, respectively, resulting the highest root length increase. For *Streptomyces* sp. 33 EM the difference between the two concentrations is insignificant. The activity of *Streptomyces* sp. 154 EM

at concentration of liquid culture of 0.5% showed the lowest increase of root length (14.4%) in comparison to the control and other strains. EM in liquid culture of the strain *Streptomyces* sp. 154 at 1.0% significantly suppressed root development with a reduction of 26.9% in comparison to the control).

Discussion. Currently, advanced scientific achievements are actively used in agriculture. One of the topical areas for the creation of environmentally friendly technologies for crops is the use of plant growth regulators [23-25]. With their help, it becomes possible to increase productivity, quality of crops, and resistance of crops to biotic or abiotic stresses. Growth regulating substances are used to obtain economically significant effects: stimulation of germination of seeds, activation of vegetative development of plants, increase of crop yield, protection of plants from a number of diseases due to strengthening of the immune status of the same plants [19, 26]. Practical interest in biological preparations is due to their effectiveness, and also because they are created on the basis of microorganisms isolated from natural biocenoses, do not pollute the environment and are safe for animals and humans. Actinobacteria are sources of biologically active substances differing in chemical structure and spectrum, possessing antibiotic, antiparasitic and growth-stimulating activity, especially *Streptomyces* genus. In the Department of General and Soil Microbiology of the Institute of Microbiology and Virology of the NASU (Ukraine), as result of wide screenings, highly active antagonists of phytopathogenic fungi, bacteria and nematodes were identified as *S. avermitilis* IMB Ac-5015, *S. netropsis* IMB Ac-5025 and *S. violaceus* IMB Ac-5027 isolated from chernozem soil. Based on the EMS of these *Streptomycetes*, new ecologically safe biopesticides have been obtained, the uniqueness of which is that, in addition to antibiotic substances, they include a balanced complex of physiologically active products of producer metabolism: amino acids, B vitamins, lipids, phytohormones stimulants that actively regulate the processes of vital activity of plants. These biopreparations are designed for modern advanced technologies for the cultivation of environmentally safe products; they are used for the pre-sowing seed, seedlings and treatments soil sanitation. They exhibit combined biological activity due to phytoregulatory activity or to increasing the plant's resistance to pathogens and parasites [27].

The studies carried out on *Streptomycetes* isolated from soils of central part of R. Moldova have demonstrated that their storage for long time (10 years) by periodic subculturing, mainly leads to a decrease in the ability to delay the growth of phytopathogenic fungi. Strains of *Streptomycetes* have been identified in which antagonism to phytopathogens is maintained or the variants appear to improve antifungal activity against a particular phytopathogen when stored in a lyophilized form.

Considering that many of the tested EMs *Streptomyces* strains had positive influence on the percentage of tomato seed germination, root length and that some of them showed nematicidal (*Streptomyces* sp. 9 and 205) and fungicidal (*Streptomyces* sp. 9) activities it is possible to conclude that some EMs of *Streptomyces* strains, isolated from unpolluted soils of R. Moldova, could be favorably considered for the preparation of new biostimulators and biopesticides.

ИЗУЧЕНИЕ СТРЕПТОМИЦЕТОВ ПОЧВ МОЛДОВЫ С АНТИФУНГАЛЬНОЙ, НЕМАТИЦИДНОЙ И ФИТОСТИМУЛИРУЮЩЕЙ ДЕЯТЕЛЬНОСТЬЮ НА ПРИМЕРЕ ТОМАТОВ

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Резюме

Цель. Целью исследований являлось определение антифунгальной, нематицидной и фитостимулирующей активности выделенных из почвы Молдовы стрептомицетов. **Методы.** Штаммы хранили на среде Чапека и овсяном агаре периодическими пересевами. Антифунгальную активность определяли методом диффузии в агар, используя в качестве тест-культур ряд фитопатогенных грибов. Для определения нематицидной и фитостимулирующей активности экзометаболитов изучаемые штаммы культивировали на комплексной среде М-I и готовили водные растворы экзометаболитов (ЭМ), содержащихся в культуральной жидкости после отделения её от биомассы центрифугированием. Семена томатов обрабатывали замачиванием в растворах ЭМ и определяли всхожесть и длину корешков. Нематицидную активность определяли по уровню смертности нематод. **Результаты.** Обнаружены штаммы, которые полностью ингибировали рост *A. alternata*, *B. cinerea* и *S. solani* (*S.* sp. 9, 10 и 17) или задерживали рост тест-культур в разной степени (диаметр зон от 25.0 до 34.0 мм). По нематицидной активности лучшие результаты показали ЭМ штаммов *S.* spp. 9 и 205. Наилучшие результаты по всхожести семян томатов сорта Факел получены при обработке 0.5 % раствором ЭМ штаммов *S.* spp. 49 и 154 (на 11.32 % больше, чем в контроле), а на рост корней – у ЭМ всех штаммов (на 73–89 % больше, чем в контроле). **Выводы.** Проведенные исследования показали, что ЭМ выделенных из почвы Молдовы стрептомицетов могут быть использованы для получения новых стимуляторов роста растений и биопестицидов.

Ключевые слова: Streptomyces, фитопатогены, антифунгальная и нематицидная активность, фитостимуляция.

ВИВЧЕННЯ СТРЕПТОМИЦЕТІВ ҐРУНТІВ МОЛДОВИ З АНТИФУНГАЛЬНОЮ, НЕМАТИЦИДНОЮ І ФІТОСТИМУЛЮВАЛЬНОЮ ДІЯЛЬНІСТЮ НА ПРИКЛАДІ ТОМАТІВ

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Резюме

Мета. Метою досліджень було визначення антифунгальної, нематицидної і фітостимулювальної активності виділених з ґрунту Молдови стрептоміцетів. **Методи.** Штами зберігали на середовищі Чапека і вівсяному агарі періодичними пересівами. Антифунгальну активність визначали методом дифузії в агар, використовуючи як тест-культури ряд фітопатогенних грибів. Для визначення нематицидної і фітостимулювальної активності екзометаболітів досліджувані штами культивували на комплексному середовищі М-І і готували водні розчини екзометаболітів (ЕМ), що містяться в культуральній рідині після відділення її від біомаси центрифугуванням. Насіння томатів обробляли замочуванням в розчинах ЕМ і визначали схожість і довжину корінців. Нематицидну активність визначали по рівню смертності нематод. **Результати.** Виявлено штами, які повністю інгібували ріст *A. alternata*, *B. cinerea* і *S. solani* (*S.* sp. 9, 10 і 17) або затримували ріст тест-культур в різному ступені (діаметр зон від 25.0 до 34.0 мм). За нематицидної активності кращі результати показали ЕМ штамів *S.* spp. 9 і 205. Найкращі результати по схожості насіння томатів сорту Факел отримані при обробці 0.5% розчином ЕМ штамів *S.* spp. 49 і 154 (на 11.32% більше, ніж в контролі), а на ріст коренів – у ЕМ всіх штамів (на 73–89% більше, ніж в контролі). **Висновки.** Проведені дослідження показали, що ЕМ виділених з ґрунту Молдови стрептоміцетів можуть бути використані для отримання нових стимуляторів росту рослин і біопестицидів.

Ключові слова: Streptomyces, фітопатогени, антифунгальна і нематицидна активність, фітостимуляція.

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Отримано 18.10.2018