TRICHODERMA ASPERELLUM ZAMBURUG'I, UNING IKKILAMCHI METABOLITLARI, BIOLOGIK FAOLLIGI

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Ilmiy rahbar: QarDU Noorganik kimyo kafedrasi o'qituvchisi
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Annotation. Trichoderma asperellum is a widespread, soil-borne fungus of the Hypocreaceae family recognized worldwide for its broad-spectrum antimicrobial and plant growth-promoting properties. In order to increase the presence of this fungus, research is being carried out in several soils. Research shows that the isolate of the fungus Trichoderma asperellum is considered to be an active substance against insect pests.

Key words: Antagonist, extract, hexane projection, microorganism, secondary metabolite.

Аннотация. Trichoderma asperellum - широко распространенный почвенный гриб семейства Hypocreaceae, признанный во всем мире благодаря своим антимикробным свойствам широкого спектра действия и способствующим росту растений. Чтобы увеличить присутствие этого гриба, проводятся исследования на нескольких почвах. Исследования показывают, что изолят гриба Trichoderma asperellum считается активным веществом против насекомых-вредителей.

Ключевые слова: Антагонист, экстракт, гексанли проексия, микроорганизм, иккиламчи метаболит.

Annotatsiya. Trichoderma asperellum Hypocreaceae oilasiga mansub keng tarqalgan, o'tkir spektrli mikroblarga qarshi va o'simliklarning o'sishini yaxshilovchi xususiyatlari tufayli butun dunyoda tan olingan tuproqda mavjud bo'lgan zamburug' hisoblanadi. Ushbu zamburug'ning mavjudligini ko'paytirish maqsadida bir qancha tuproqlarda tadqiqotlar olib borilmoqda. Tadqiqotlar Trichoderma asperellum zamburug'i izolyatining hasharotlarni qiruvchi zararkunandalarga qarshi faol modda hisoblanishini izohlamoqda.

Kalit so'zlar: Antagonist, ekstrakt, geksanli proyeksiya, mikroorganizm, ikkilamchi metabolit.

Kirish

Mikologik izlanishlar atrof-muhit va sog'liqni saqlashning turli sohalarida zararli mikroorganizmlar uchun yangi moddalar to'lqinini ishlab chiqarmoqda.Bu esa mikologiya sohasini rivojlanishi uchun katta hissa qo‘shmoqda. Trichoderma asperellum Ascomycota turiga,, Sordariomycetes sinfiga, Hypocreales turkumiga va Hypocreaceae oilasiga mansub va antibiotiklardan tashqari fermentlarni ishlab chiqarish orqali ham mikroblarga hujum qilish qobiliyatiga ega.Trichoderma asperellum 70yildan ortiq vaqt mobaynida o'simlik zararkunandalariga qarshi

foydalanilgan. Trichoderma asperellum kasalliklarga qarshi kurashishda, o‘simliklarning hosildorligini yuqori darajada oshirishda hamda qishloq xo‘jaligida keng qo‘llaniladi. Qishloq xo'jaligi chiqindilaridan olinadigan kompost va Trichoderma asperellum shtammi bodring o‘simligida Rhizoctonia solanini yo‘qotadi.

Biz zararli zamburug‘larga qarshi kurashish maqsadida *Trichoderma* asoerellum zamburug‘i ustida ilmiy tadqiqot ishlari olib bordik. Bu zamburug‘ turli xil tuproqda,ildizlarda va bargli muxitlarda keng tarqalgan. *Trichoderma* asoerellum zamburug‘i tijorat fermentlari, o‘simliklarning o‘sishini tezlashtiruvchi fitogormonlari, o‘simliklardagi kasalliklarni nazaroratlovchi antibiotiklar ishlab chiqarish xususiyatiga egaligi bilan ishlab chiqarishda sanoatda va dori tayyorlashda katta ahamiyatga ega.

Global miqyosda *Trichoderma asperellum zamburug‘i* samarali biologik nazorat preparati sifatida katta muvaffaqiyatlarga erishgani isbotlandi,chunki ular muhim tibbiy salohiyatiga ega bo‘lgan turli ikkilamchi metabolitlarni sintez qilish uchun noyob qobiliyatga egadir.Adabiyot manbalarida Faul va boshqalar mikroorganizmlar hosil qiluvchi turli xil organik va noorganik komponentlarni xromatografik usullar yordamida ajratish va yaxshilash usullarini keltirib chiqaradi. Mikroorganizmlarda mavjud moddalarning tuzulishini va ularni kuchliroq bilish, turli xil biotexnologik jarayonlarda qo'llab-quvvatlanadi. Yig'ish vaqtida Trichoderma turkumli zamburug‘lar ishlab chiqarilgan organik birikmalarni aniqlash uchun GSX–MS xromatografiya usullari zarur. Trichoderma zamburug'larining turli xil uchuvchan metabolitlari GSX-MS xromatografiya bilan aniqlangan.

Geksanli guruhlardan har xil tizimlarda YuQX qo'yilganda aniq bir pik bermay qolguncha davom ettiriladi. Aniqki, organik erituvchi yordamida geksan kuchsiz eritiladi. Ekstraktni birinchi geksanda yutilishini, ekstraktning yog'simon moddalaridan tozalab olishdan tarkib topgan. Geksanli guruhni GSX da olib borildi.

Kolonkada geksanli fraksiya chiqqandan ajratib olingan modda GSX-MS-dan bir qancha sohalar uchun kerakli moddalar mavjud ekanligi aniqlandi (1-jadval).

1-jadval

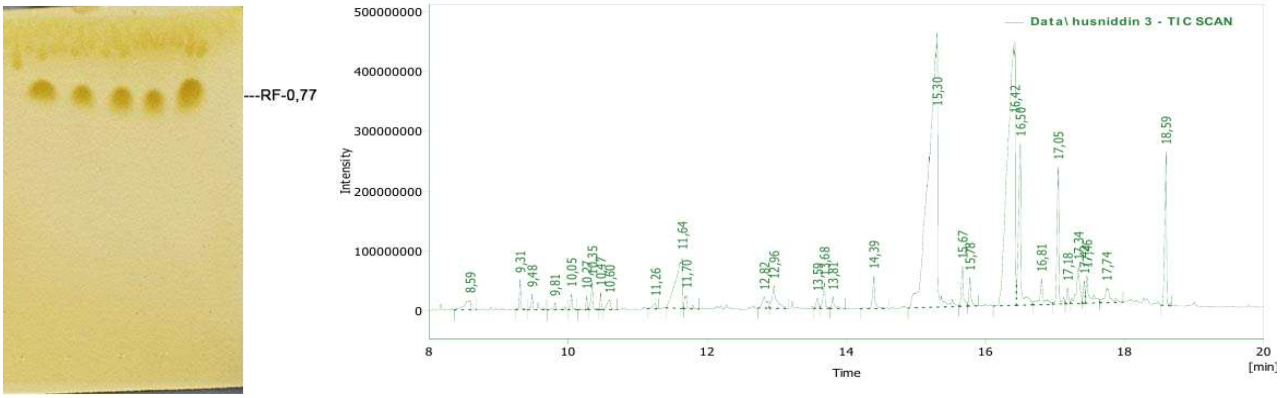
Geksanli fraksiyadan aniqlangan Trichoderma asperellum zamburug‘ining ikkilamchi metabolitlari:

№	Metabolit nomlari	Kimyoviy formula	Molekulyar massa g/mol	Yutilish vaqti
1	(1R,4R,4aS,8aR)-4,7-Dimethyl-1-(prop-1-en-2-yl)-1,2,3,4,4a,5,6,8a-octahydronaphthalene	$C_{15}H_{24}$	204.3511	11,402
2	1H-Cycloprop[e]azulene, 1a, 2, 3, 4, 4a, 5, 6, 7b-octahydro-1, 1, 4, 7-tetramethyl	$C_{15}H_{24}$	204.35	11,535
3	7-epi-trans-sesquisabinene hydrate	$C_{15}H_{26}$	222.37	11,628
4	Tricyclo[5.2.2.0(1,6)]undecan-3-ol, 2-methylene-6,8,8-trimethyl-	$C_{15}H_{24}O$	220.35	12,273
5	Tetradecane, 2,6,10-trimethyl-	$C_{17}H_{36}$	240.5	12,448
6	(1R,7S,E)-7-Isopropyl-4,10-dimethylenecyclodec-5-enol	$C_{15}H_{24}O$	220.3505	12,696
7	Cedren-13-ol, 8-	$C_{15}H_{24}O$	220.3505	12,789
8	Longipinocarveol, trans-	$C_{15}H_{24}O$	220.35	13,004
9	2(1H)Naphthalenone, 3,5,6,7,8,8a-hexahydro-4,8a-dimethyl-6-(1-methylet	$C_{15}H_{22}O$	218.3346	13,276
10	1H-Cyclopenta[a]pentalen-7-ol, decahydro-3,3,4,7a-tetramethyl-, 4-methy	$C_{17}H_{28}O_2$	264.4	13,405
11	Dihydroxanthin	$C_{17}H_{24}O_5$	308.4	13,713
12	2-[4-methyl-6-(2,6,6-trimethylcyclohex-1-enyl)hexa-1,3,5-trienyl]cyclohex-1	$C_{23}H_{32}O$	324.5	14,423
13	2-Hydroxy-4,4,8-trimethyltricyclo[6.3.1.0(1,5)]dodecan-9-one	$C_{15}H_{24}O_2$	236.35	14,692
14	l-(+)-Ascorbic acid 2,6-dihexadecanoate	$C_{38}H_{68}O_8$	652.9	15,100
15	Hexadecanoic acid, ethyl este	$C_{17}H_{34}O_2$	270.4507	15,287
16	Bicyclo[9.3.1]pentadeca-3,7-dien-12-ol, 4,8,12,15,15-pentamethyl-, [1R-(1	$C_{20}H_{34}O$	290.4834	15,491
17	1-Heptatriacotanol	$C_{37}H_{76}O$	537.0	15,752
18	17-Pentatriacontene	$C_{35}H_{70}$	490.9	15,975
19	cis-13-Octadecenoic acid	$C_{18}H_{34}O_2$	282.5	16,240
20	Octadecanoic acid	$C_{18}H_{36}O_2$	284.5	16,361
21	(E)-9-Octadecenoic acid ethyl ester	$C_{20}H_{38}O_2$	310.5	16,401
22	Heptadecanoic acid, 15-methyl-, ethyl ester	$C_{19}H_{38}O_2$	298.5038	16,541
23	4,8,13-Cyclotetradecatriene-1,3-diol, 1,5,9-trimethyl-12-(1-methylethyl)-	$C_{20}H_{34}O_2$	306.5	17,254
24	9-(2',2'-Dimethylpropanoilhydrazono)-3,6-dichloro-2,7-bis-[2-(diethylamino)	$C_{30}H_{42}Cl_2N_4O_3$	577.6	18,558
25	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	$C_{26}H_{54}$	366.7	19,776

Tuzilishi aniqlangan metabolitlarning biologik xususiyatlari o'rganilganda asosiy qismi efirsimon moddalar va terpinoid guruhlariga xos moddalar bo'lib,

antimikrob, antioksidant va yallig'lanishga qarshi ta'sirga ega ekanligi aniqlandi.Octadecanoic acid guruhiga kiruvchi birikmalar (19,20,21,25) yarali yallig'lanishga qarshi, hipokolesterolemik, saratonni oldini olish, gepatoprotetive, nematidid, antiekzemik, 5-alfa reduktaza ingibitori ekanligi bir adabiyotlarda keltirilgan.Geksanli fraksiyada olingan 25 ta metabolitlardan ko'p qismi past molekulyar yog' kislotali moddalar ekanligi aniqlandi. Yog' kislotali metabolitlar yoki to'yinmagan yog' kislotalar antifungal samaradorligi zanjir uzunligining oshib borishi bilan ortadi. Aniqlangan metabolitlarning ayrimlari tibbiyot va kosmetika sohasiga oid istiqbolli moddalar sifatda qo'llaniladi.

Xromatografik kolonkadagi ekstraktlarni taqsimlashlarga ajratish geksandan olingan elyuent sifatida xloroformda davom ettirildi. Xloroformli fraksiyalarda moddalar ajralishiga qarab YuQX qo'yib borildi. YuQX uchun xloroform - metanol 19:1 sistemadan foydalanildi. Xromatografik plastinkada yagona pik bergan fraksiya yig'ib borildi va Rf nuqtalari aniqlandi. Rf nuxtasi 0,77 ga tengligi aniqlandi (3-rasm). Xloroformlidagi ikkilamchi metabolitlar GSH da aniqlandi (3-rasm).



1-rasm.Xloroformli fraksiyaning yupqa qatlamli va gaz suyuqlik xromatografiyasi

Tajriba davomida GSX xromatografiyasida aniqlangan uchuvchan metabolitlar MS ma'lumolar bazasida idenfikatsiya qilindi.(2-jadval)

2-jadval

Trichoderma asperellum zamburug'ining Xloroformli fraksiyada aniqlangan ikkilamchi metabolitlari

№	Metabolit nomlari	Kimyoviy formula	Molekulyar modda g/mol	Yutilish vaqti
1	Undecylenic acid	$C_{11}H_{20}O_2$	184.27	11,255
2	9-Oxononanoic acid	$C_9H_{16}O_3$	172.22	11,639

3	Isopropyl palmitate	$C_{19}H_{38}O_2$	298.511	11,700
4	Cyclopentadecanone, 2-hydroxy-	$C_{15}H_{28}O_2$	240.3816	12,821
5	9-Octadecynoic acid, methyl ester	$C_{19}H_{34}O_2$	294.4721	12,957
6	9,12-Octadecadienoyl chloride, (Z,Z)-	$C_{18}H_{31}ClO$	298.9	13,588
7	Tetradecanoic acid	$C_{14}H_{28}O_2$	228.37	13,685
8	Geranyl isovalerate	$C_{15}H_{26}O_2$	238.37	13,807
9	Pentadecanoic acid	$C_{15}H_{30}O_2$	242.40	14,394
10	n-Hexadecanoic acid	$C_{16}H_{32}O_2$	256.4241	15,304
11	Heptadecanoic acid	$C_{17}H_{34}O_2$	270.5	15,777
12	Oleic Acid	$C_{18}H_{34}O_2$	282.5	16,422
13	Octadecanoic acid	$C_{18}H_{36}O_2$	284.5	16,501
14	1-Naphthalenepropanol, a-ethenyldecahydro-2-hydroxy-a,2,5,5,8a-pentam	$C_{20}H_{36}O_2$	308.5	16,806
15	1,3,6,10-Cyclotetradecatetraene, 3,7,11-trimethyl-14-(1-methylethyl)	$C_{20}H_{32}$	272.5	17,046
16	7,10,13-Eicosatrienoic acid, methyl ester	$C_{21}H_{36}O_2$	320.5	17,182
17	Oxiraneoctanoic acid, 3-octyl-, cis-	$C_{19}H_{36}O_3$	312.5	17,741
18	Diisooctyl phthalate	$C_{24}H_{38}O_4$	390.6	18,594

GSX-MS ma'lumotlar bazasida aniqlangan uchuvchan metabolitlar ichida, *Undecylenic acid, Pentadecanoic acid* metaboliti *Myrothecium verrucaria, Saccharomyces cerevisiae nisbatan,* Heptadecanoic acid metaboliti *Botrytis cinerea, Cladosporium cucumerinum, Fusarium oxysporum, Phytophthora infestans, Pythium aphanidermatum, Sphaerotheca fuliginea* ga nisbatan, Oleic Acid uchuvchan metaboliti *Crinipellis pernicosa, Pythium ultimum* ga nisbatan yuqori antimikroblik xususiyatlariga ega ekanligi adabiyot manbalarida ma'lum.Tetradecanoic acid, 9-Octadecynoic acid, methyl ester, 9,12-Octadecadienoyl chloride, (Z,Z)-, Octadecanoic acid metabolitlari esa yarali yallig'lanishga qarshi,hipokolesterolemik, saratonni oldini olish, gepatoprotektiv, nematitsid, antiekzemik, 5-alfa reduktaza ingibatori hisoblanadi.

Xulosa

Trichoderma asperellum zamburug'ining asosiy metabolitlari fenollar va terpinoidlar guruhiga mansub moddalar ekanligi va ushbu metabolitlar antimikrob, yallig'lanishlarga qarshi vosita, nematisit va antiekzemik yallig'lanishga qarshi ikkilamchi metabolitlar ekanligi aniqlandi. Terpenoidlar yer yuzidagi eng ko'p tarqalgan tabiiy birikmalar bo'lib, turli xil uchuvchan va uchuvchan bo'lmagan ikkilamchi metabolitlarni o'z ichiga oladi. Ularning ko'pchiligi zamburug'lar tomonidan sintez qilinadi.

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