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Evaluation of the toxicity of Streptomyces aburaviensis (R9) extract towards various agricultural pests

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ABSTRACT

The dichloromethane extract of culture filtrate from Streptomyces aburaviensis R9 was evaluated using various rapid bioassays to determine potential inhibitory effects towards phytopathogenic fungi (Colletotrichum acutatum, C. fragariae, C. gloeosoprioids, Botrytis cinerea, Fusarium oxysporum, Phomopsis viticola and P. obscurans), fish bacterial pathogens (Edwardsiella ictaluri and Flavobacterium columnare), a green alga (Selenastrum capricornutum), plant seeds [Bent grass (Agrostis sp.) monocot and lettuce (Lactuca sativa) dicot] and 2-methylisoborneol (MIB)-producing cyanobacteria (Planktothrix perornata and Pseudanabaena sp.). The dichloromethane extract showed selective inhibition against the cyanobacterium P. perornata, with a lowest-complete-inhibition concentration (LCIC) of 10 mg/L and lowest-observed-effect concentration (LOEC) of 10 mg/L while LCIC and LOEC values were 100 mg/L when tested against S. capricornutum. This extract also showed slight meristematic cytogenic necrosis at 200 mg/L towards germinated seeds of both test plants. The compounds were not very toxic towards the channel catfish (Ictalurus punctatus) pathogenic bacteria E. ictaluri and F. columnare. Preliminary evaluation of the extract toward C. acutatum, C. fragariae and C. gloeosoprioids using TLC bioautography revealed moderate activity. However, further evaluation of the extract using a microtiter plate bioassay determined that inhibition was strongest against C. acutatum and C. fragariae, though this inhibitory activity diminished at 72 hours and was moderately less active than the commercial fungicides azoxystrobin and captan when comparing 1 - 100 mg/L levels at 48 hours.

KEYWORDS

Algae; Catfish; Cyanobacteria; Fungi; Pathogens; Streptomyces

Cite this paper

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References

[1] Reganold, J.P., Papendick, R.I. and Parr, J.F. (1992) Sus- tainable agriculture. Scientific American, 262, 112-120. doi:10.1038/scientificamerican0690-112

[2] Parr, J.F. and Hornick, S.B. (1992) Agricultural use of organic amendments: A historical perspective. American Journal of Alternative Agriculture, 7, 181-189. doi:10.1017/S0889189300004781

[3] Cohen, Y. and Coffey, M.D. (1986) Systemic fungicides and the control of oomycetes. Annual Review of Phytopa- thology, 24, 311-338. doi:10.1146/annurev.py.24.090186.001523

[4] Fruh, T., Chemla, P., Ehrler, J. and Farooq, S. (1996) Natural products as pesticides: Two examples of strereose- lective synthesis. Pesticide Science, 46, 37-47. doi:10.1002/(SICI)1096-9063(199601)46:1<37::AID-PS339>3.0.CO;2-K

[5] Mallik, M.A.B. (2001) Selective isolation and screening of soil microorganisms for metabolites with herbicidal potential. Journal of Crop Production, 4, 219-236. doi:10.1300/J144v04n02_07

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[6] Heisey, R.M. and Putnam, A.R. (1990) Herbicidal active- ity of the antibiotics geldanamycin and nigericin. Journal of Plant Growth Regulation, 9, 19-25. doi:10.1007/BF02041937

[7] Higa, T. (1991) Effective microorganisms: A biotechnology for mankind. In: Parr, J.F., Hornick, S.B. and Whitman, S.E., Eds., Proceedings of the 1st International Conference on Kyusei Nature Farming, USDA, Washington, DC, 8-14.

[8] Blatz, R.H. (1998) Genetic manipulation of antibiotic producing Streptomyces. Trends in Microbiology, 6, 76-83. doi:10.1016/S0966-842X(97)01161-X

[9] El-Trabily, K.A., St. J. Hardy, G.E., Sivasithamparam, K., Hussein, A.M. and Kurtb?ke, D.I. (1997) The potential for the biological control of cavity-spot disease of carrots, caused by Pythium coloratum, by streptomycete and non-streptomycete actinomycetes. New Phytologist, 137, 495-507. doi:10.1046/j.1469-8137.1997.00856.x

[10] El-Tarabily, K., Soliman, M., Nassar, A., Al-Hassani, H., Sivasithamparam, K., McKenna, F. and St. J. Hardy, G.E. (2000) Biological control of Sclerotinia minor using a chitinolytic bacterium and actinomycetes. Plant Pathol- ogy, 49, 573-583. doi:10.1046/j.1365-3059.2000.00494.x

[11] Saadoun, I. and Al-Momani, F. (1997) Streptomycetes from Jordan soils active against Agrobacterium tumefa- ciens. Actinomycetes, 8, 29-36.

[12] Saadoun, I., Hameed, K., Al-Momani, F., Malkawi, H., Meqdam, M. and Mohammad, M.J. (2000) Characteriza- tion and analysis of antifungal activity of soil streptomy- cetes isolated from North Jordan. Egyptian Journal of Microbiology, 35, 463-471.

[13] Seto, H., Fujioka, T., Furihatha, K., Kaneko, J. and Ta- kahkashi, S. (1989) Structure of complestain a very strong inhibitor of protease activity of complement in the human complement system. Tetrahedron Letters, 37, 4987-4990. doi:10.1016/S0040-4039(01)80562-1

[14] Tahtamouni, M.E.W., Hameed, K.M. and Saadoun, I. (2006) Biological control of Sclerotinia sclerotiorum us- ing indigenous chitinolytic actinomyctes in Jordan. The Plant Pathology Journal, 22, 107-114.

[15] Mallik, M.A.B. (1997) Isolates of soil actinomycetes with potential for phytotoxin production. Journal of Chemical Ecology, 23, 2683-2693. doi:10.1023/A:1022502724711

[16] Saadoun, I., Al-Momani, F., Malkawi, H. and Mohammad, M.J. (1999) Isolation, identification and analysis of anti- bacterial activity of soil streptomycetes isolates from North Jordan. Microbios, 100, 41-46.

[17] Saadoun, I. and Gharaibeh, R. (2003) The Streptomyces flora of Badia region of Jordan and its potential as a source of antibiotics active against antibiotic-resistant bacteria. Journal of Arid Environments, 53, 365-371. doi:10.1006/jare.2002.1043

[18] Saadoun, I., Wahiby, L., Ababneh, Q., Jaradat, Z., Massadeh, M. and Al-Momani, F. (2008) Recovery of soil streptomycetes from arid habitats in Jordan and their potential to inhibit multi-drug resistant Pseudomonas ae- ruginosa pathogens. World Jorunal of Microbiology and Biotechnology, 24, 157-162. doi:10.1007/s11274-007-9451-2

[19] Bataineh, S., Saadoun, I., Hameed, K.M. and Ababneh, Q. (2008) Screening for soil Streptomycetes from north Jordan that can produce herbicidal compounds. Polish Journal of Microbiology, 57, 297-305.

[20] Dayan, F.E., Romagni, J.G. and Duke, S.O. (2000) Inves- tigating the mode of action of natural phytotoxins. Jour- nal of Chemical Ecology, 26, 2079-2094. doi:10.1023/A:1005512331061

[21] Schrader, K.K., De Regt, M.Q., Tucker, C.S. and Duke, S.O. (1997) A rapid bioassay for selective algicides. Weed Technology, 11, 767-774.

[22] Schrader, K.K. and Harries, M.D. (2006) A rapid bioassay for bactericides against the catfish pathogens Edwardsiella ictaluri and Flavobacterium columnare. Aquaculture Research, 37, 928-937. doi:10.1111/j.1365-2109.2006.01514.x

[23] Smith, B.J. and Black, L.L. (1990) Morphological, cul- tural, and pathogenic variation among Colletotrichum species isolated from strawberry. Plant Disease, 74, 69-76. doi:10.1094/PD-74-0069

[24] Meazza, G., Dayan, F.E. and Wedge, D.E. (2003) Activity of quinones on Collectotrichum species.