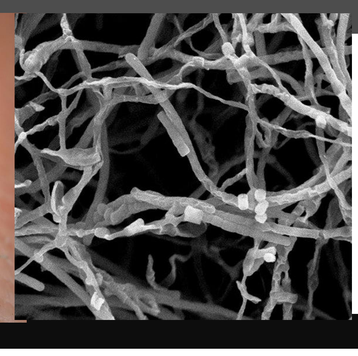
Mosquito larvicidal activity of juvenile hormone antagonists from *Streptomyces abikoensis*

Dong Hwan Park[1], Jae Young Choi[2], Min Gu Park[1], Minghui Wang[1], Hyun Ji Kim[1] and Yeon Ho Je[1,2]

[1]Department of Agricultural Biotechnology, Seoul National University, Seoul, Republic of Korea
[2]Research Institute for Agriculture and Life Sciences, Seoul National University, Seoul, Republic of Korea

Lab. Insect Microbiology and Biotechnology
Dept. Agricultural Biotechnology
Seoul National University
Prof. Yeon Ho Je
btrus@snu.ac.kr



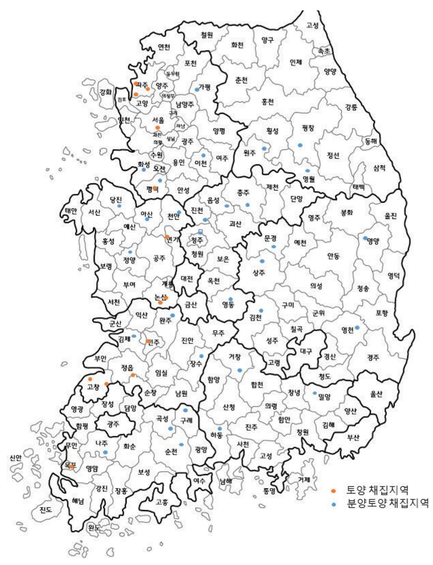
Abstract

Insect growth regulators (IGRs) are one of the promising alternatives for conventional mosquitocides because of their high specificity and low toxicity to environment. Streptomyces have received for their role in production of various secondary metabolites including insecticides. To find novel insecticides, culture filtrates of 2,875 Streptomyces isolates were tested for their IGR activities and mosquitocidal activities. Among them, IMBL-1939 showed the highst mosquitocidal activities without significant adverse effect on fish. To isolates mosquitocidal substances, mass cultured *Streptomyces* IMBL-1939 supernatant were extracted with solvent and mosquitocidal substances were isolated by bioassay-guided fractionation of the culture filtrate.

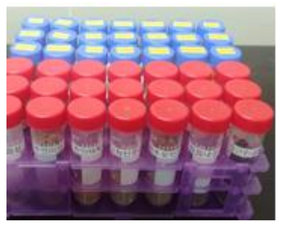
Key words: *Streptomyces*, *Aedes albopictus*, insect growth regulator, juvenile hormone antagonist

Methods

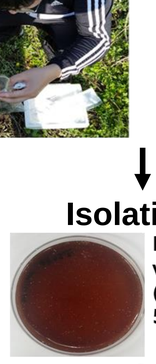
● Isolation of *Streptomyces* in Korean soil



Soil sampling



Isolation



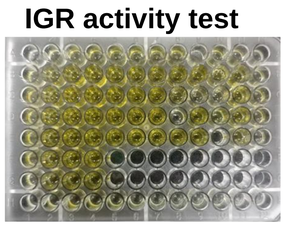
Humic acid vitamin agar (28 ℃, 5days)

2,875 *Streptomyces* isolates

● Screening of *Streptomyces* culture filtrates of their IGR activity and mosquiticidal activity

***Streptomyces* culture filtrates**

IGR activity test



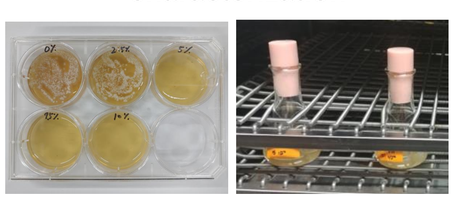
Mosquito bioassay

Acute fish toxicity test

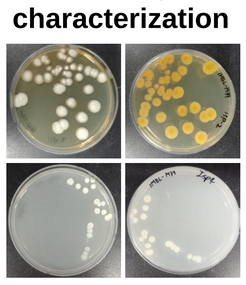
IMBL-1939 strain

● Characterization of IMBL-1939 strain

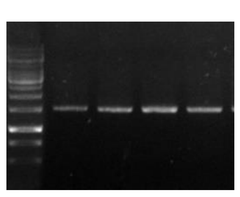
Physiological characterization



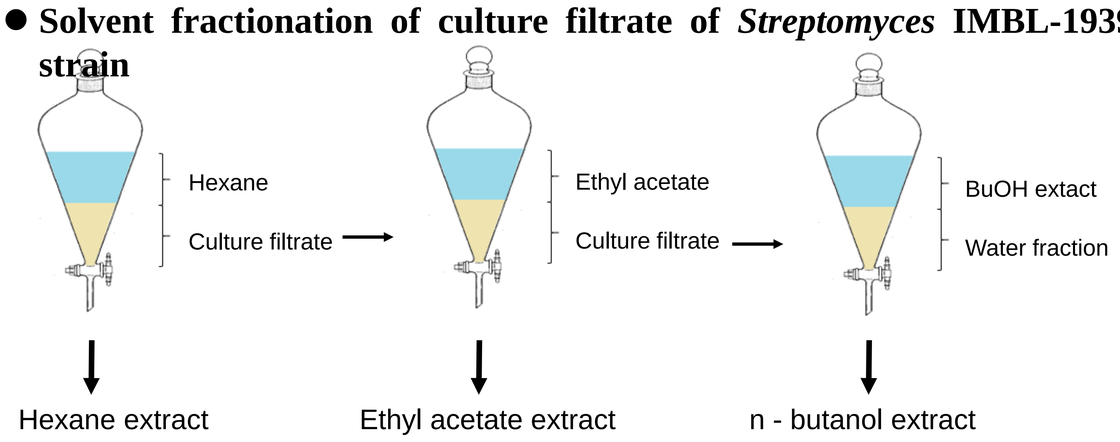
Morphological characterization



Phylogenetical characterization



● Solvent fractionation of culture filtrate of *Streptomyces* IMBL-1939 strain



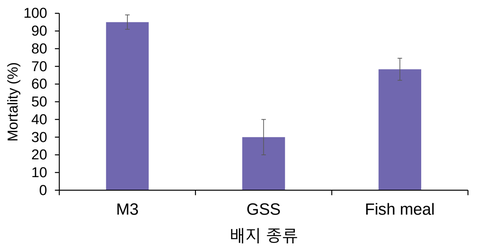
Results

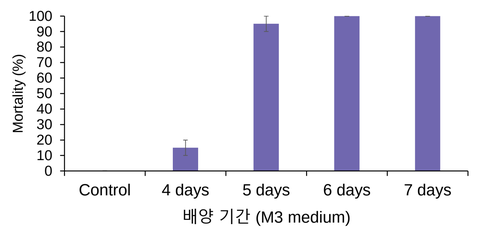
● Characteristics of strain *Streptomyces* IMBL-1939

○ Cultural characteristics of strain *Streptomyces* IMBL-1939

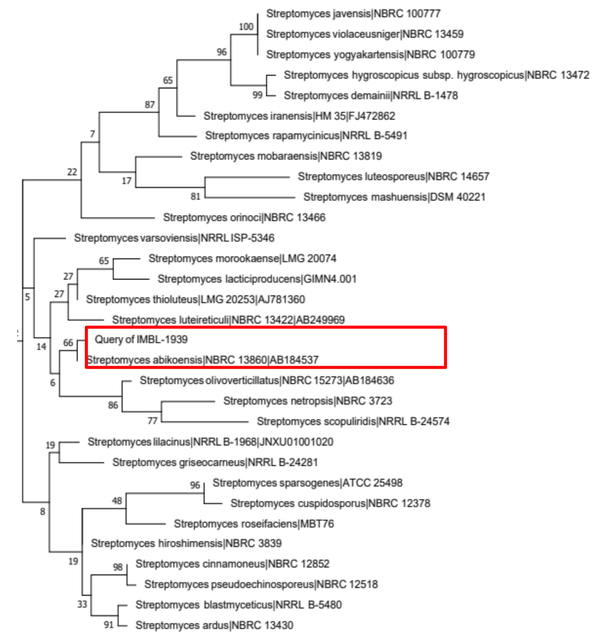
Medium	Growth	Aerial mycelium	Substrate mycelium	Pigment
Yeast Malt Extract Agar (ISP-2)	Good	Light grey	Brown	Absent
Inorganic Salt Starch Agar (ISP-4)	Good	White	Beige	Absent
Glycerol-Asparagine Agar (ISP-5)	Good	White	Brown	Absent

Characteristics	Concentration (%)	Growth
NaCl tolerance	0	+
	2.5	+
	5	-
	7.5	-
	10	-

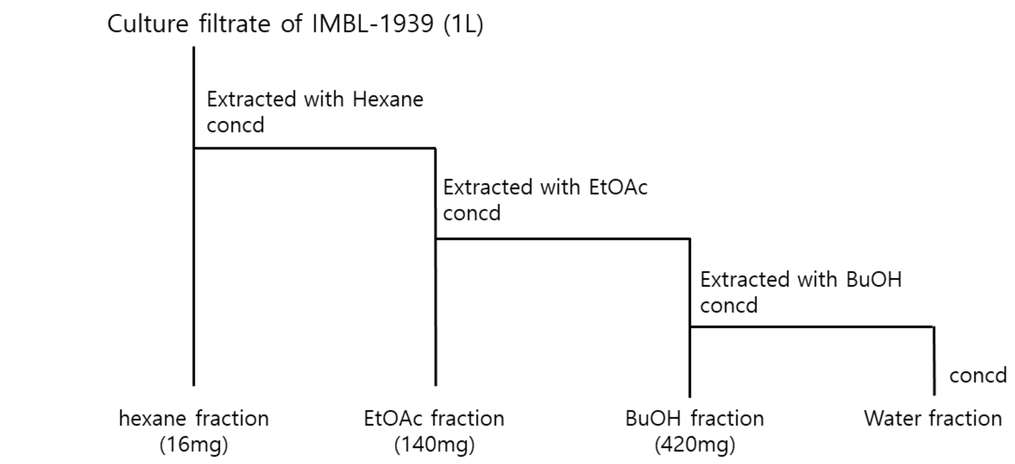


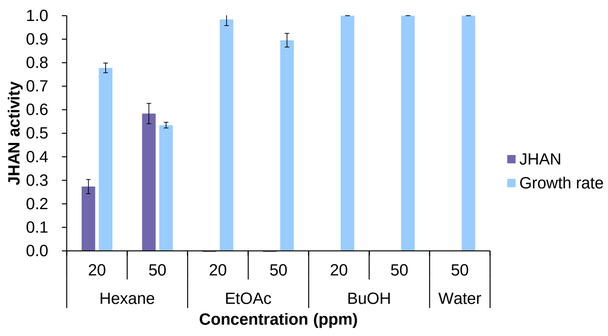


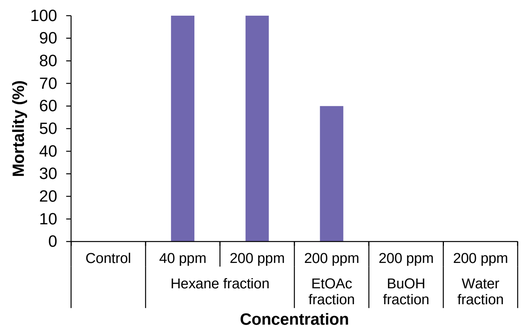
○ 16s rRNA phylogeny



● Solvent fractionation of IMBL-1939 culture filtrate







Conclusion

1. ***Streptomyces* IMBL-1939 strain showed superior insecticidal activity against *Aedes albopictus* larvae without no toxicity to fish**
2. **IMBL-1939 strain was identified as *Streptomyces abikoensis* according to morphological, physiological characteristics and nucleotide sequence analysis of 16S rRNA gene**
3. **Hexane extracts from IMBL-1939 culture filtrate exhibited mosquitocidal activity with JHAN activity.**

Reference

1. **Lee, Seok-Hee, et al. "Identification of plant compounds that disrupt the insect juvenile hormone receptor complex." Proceedings of the National Academy of Sciences 112.6 (2015): 1733-1738.**
2. **Solecka, Jolanta, et al. "Biologically active secondary metabolites from Actinomycetes." Open Life Sciences 7.3 (2012): 373-390.**
3. **Van der Meij, Anne, et al. "Chemical ecology of antibiotic production by actinomycetes." FEMS microbiology reviews 41.3 (2017): 392-416.**