Comparative assessment of the *in vitro* insecticide degradation abilities of diverse gut bacteria associated with rice stem borer complex

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Ento24 10 - 12 Sept

INTRODUCTION & MOTIVATION

- Rice: A globally important crop
- Stem borers: Most dreaded pests of rice
- Very meagre reports on comparative study of gut microbiome amongst different rice stem borers
- Insecticide degrading ability of gut bacterial microbiome of rice stem borers yet unexplored at global level

MATERIAL AND METHODS

ICAR-NRRI, Cuttack

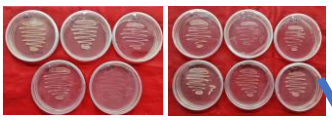
Varshadhan CRLC-899

White Ear Heads

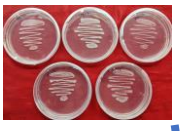
YSB PSB SSB

Rice stem borer complex: *Scirpophaga incertulus* (YSB), *Sesamia inferens* (PSB) *and Chilo suppresalis* (SSB)

Isolation of gut bacteria Orozco-Flores et al. (2017)



Morphological & Biochemical characterization Cappucino and Sherman (2014)

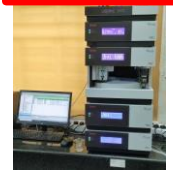


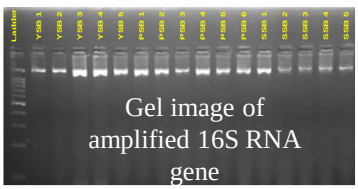
DNA isolation & PCR Weisburg et al. (1991

HPLC Mahapatra et al. (2017)

KOH test, Casein hydrolysis, Starch hydrolysis, Gelatin liquefaction, Indole production, H_2S production, Gram test

Quantitative analysis of insecticide degradation ability





Gel image of amplified 16S RNA gene

Bacterial identity confirmation and sequence submission in GenBank

RESULTS AND DISCUSSION

Table 2: Taxonomic affiliation & *in vitro* degradation efficiency of insecticides (after 72 hrs) by isolated gut bacteria

Isolate code	Scientific name	Accession number	Degradation efficiency (%)	
			Chlorantraniliprole	Thiamethoxam
YSB 1	*Klebsiella* sp.	ON520695	74.69^{A} (59.59)	26.62^{D} (31.06)
YSB 2	*Bacillus* sp.	OR186508	10.24^{L} (18.92)	33.61^{A} (35.43)
YSB 3	***B. pumilus****	ON515471	59.03^{E} (50.38)	31.46^{B} (34.11)
YSB 4	***A. calcoaceticus****	ON515472	74.00^{A} (59.44)	29.44^{C} (32.86)
YSB 5	***B. cereus****	ON515473	68.76^{BC} (56.01)	21.17^{EFG} (27.40)
PSB 1	*Stenotrophomonas* sp.	ON515474	67.61^{C} (55.73)	20.38^{GH} (26.84)
PSB 2	*E. Faecalis*	ON515475	52.73^{F} (46.26)	26.58^{D} (31.04)
PSB 3	*S. Maltophilia*	ON515476	12.99^{K} (21.01)	20.74^{FGH} (27.10)
PSB 4	*Staphylococcus* sp.	ON520735	14.05^{J} (22.47)	21.70^{EF} (27.77)
PSB 5	*S. Pavanii*	ON520736	69.68^{BC} (56.38)	14.30^{J} (22.22)
PSB 6	***Paraclostridium* sp.***	ON520779	28.51^{H} (31.91)	31.80^{B} (34.32)
SSB 1	*Bacillus sp.*	ON520737	42.91^{G} (41.06)	20.36^{GH} (26.82)
SSB 2	*B. Proteolyticus*	ON520738	70.65^{B} (57.06)	19.73^{HI} (26.37)
SSB 3	*B. Stratosphericus*	ON520739	65.67^{D} (54.17)	22.04^{E} (28.00)
SSB 4	*B. Subtilis*	ON520740	59.40^{E} (50.44)	19.66^{HI} (26.32)
SSB 5	*B. albus*	ON520741	19.34^{I} (26.57)	18.83^{I} (25.72)

*** First report from the respective insect species**

- The gut bacterial composition of the three rice stem borers, of **same guild collected from the same host at the same time**, varied to a great extent

Proteobacteria: 31%	Firmicutes: 69%	
Bacillaceae: 50%	Xanthomonadaceae:18.75%	Rest: 6.25% each

CONCLUSION & FUTURE THRUSTS

- Apart from the host plants the insects gut microbiome is also significantly influenced by the respective insect species
- The differential abilities of the gut bacterial isolates to degrade the insecticides provide insights into their **possible involvement in xenobiotic detoxification in their host** and further study on this aspect may improve management strategies of these pests.
- The results of this study gives an exciting prospect of using these borers **as novel sources for profiling insecticide-degrading microbes for bioremediation programs**.

REFERENCES

Goswami, S., Das, S. B., Rath, P. C., Adak, T., Parameswaran, C., Jambhulkar, N. N., ... & Annamalai, M. (2024). Comparative assessment of the gut bacterial diversity associated with field population of three rice stem borers and their in vitro insecticide degradation ability. *Journal of Asia-Pacific Entomology*, 27(2), 102229.

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