

# BIODEGRADATION OF THE PYRETHROID PESTICIDE CYFLUTRIN BY THE HALOPHILIC BACTERIUM

## PHOTOBACTERIUM GANGHWENSE ISOLATED FROM CORAL REEF ECOSYSTEM

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### Introduction

Cyfluthrin is a commonly used cheap and effective pyrethroid pesticide. *Photobacterium ganghwense* (PG) is a halophilic Gram negative bacterium in the family Vibrionaceae.

### Materials & Methods

#### 1. SAMPLING

LOCATION : Coral reef ecosystem off Tuticorin, Tamil Nadu.

SAMPLE : Coral Mucus of *Acropora* sp.

#### 2. CYFLUTHRIN-DEGRADING BACTERIA ISOLATION AND IDENTIFICATION

ISOLATION MEDIUM: Nutrient agar

BIOCHEMICAL -TESTS : As per Bergey's Manual of Systematic Bacteriology

MOLECULAR IDENTIFICATION : 16 S rRNA sequencing

#### 3. TEST FOR DEGRADATION OF CYFLUTHRIN BY *P.GANGHWENSE*

MEDIUM : Peptone, FePO<sub>4</sub>, NaCl and Yeast extract in Sea water

CYFLUTHRIN PESTICIDE USED : Solfac WP 10 (100mg/L)

CULTURE CONDITIONS : 7 days, 30°C pH 8 at 180 rpm

Biomass monitored on daily basis at OD<sub>600</sub>

Post treatment : Centrifuged and filtered in 0.45 and 0.2 μm membrane filters.

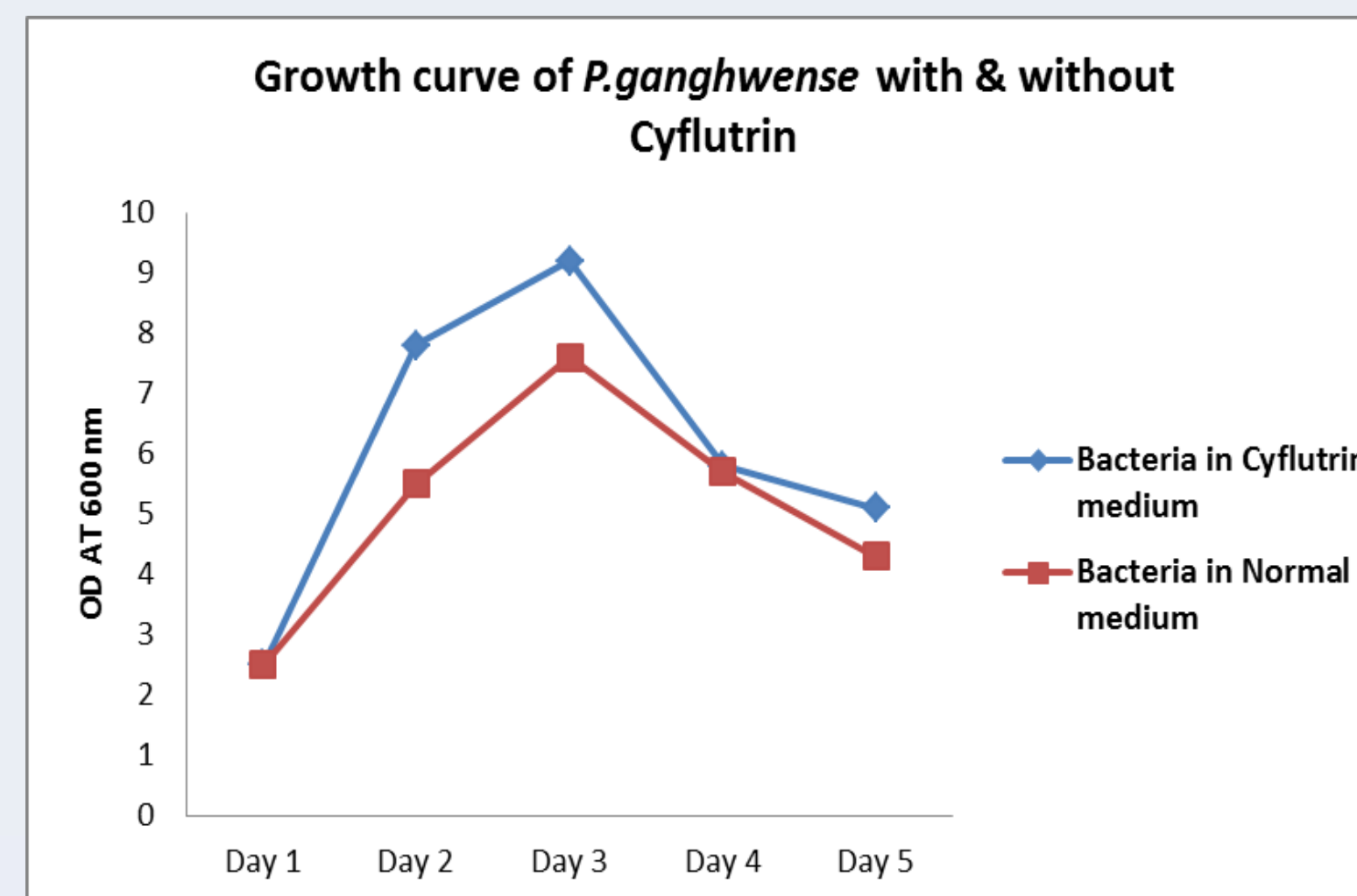
Pesticide analysis : GC/MS-MS technique

#### 4. CYTOTOXICITY ANALYSIS ON FISH CELL LINE EM4SPEX DERIVED FROM *EPINEPHELUS MALABARICUS*.

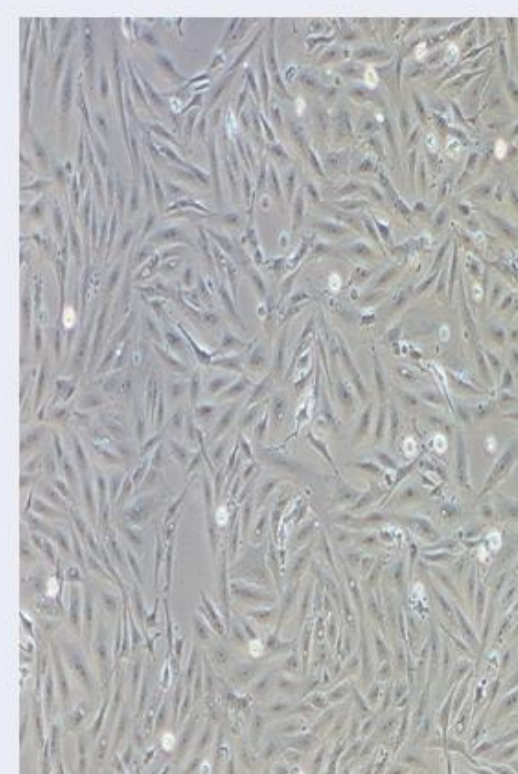
##### Results



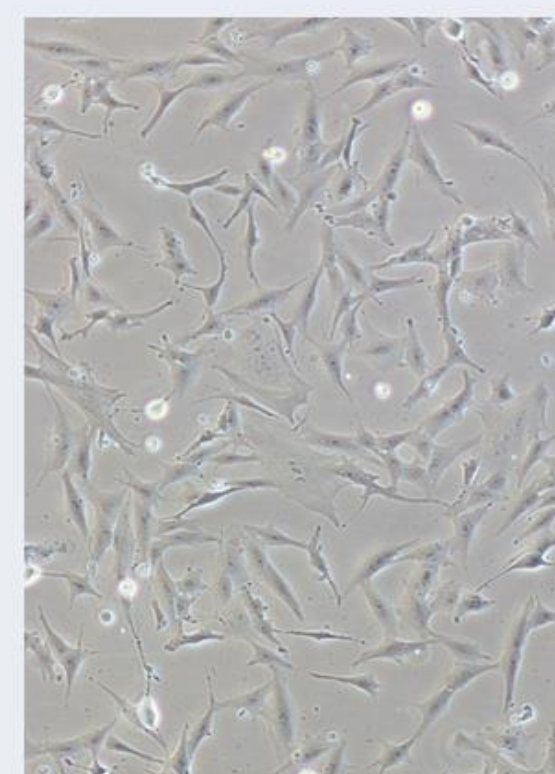
*P.ganghwense* on NA



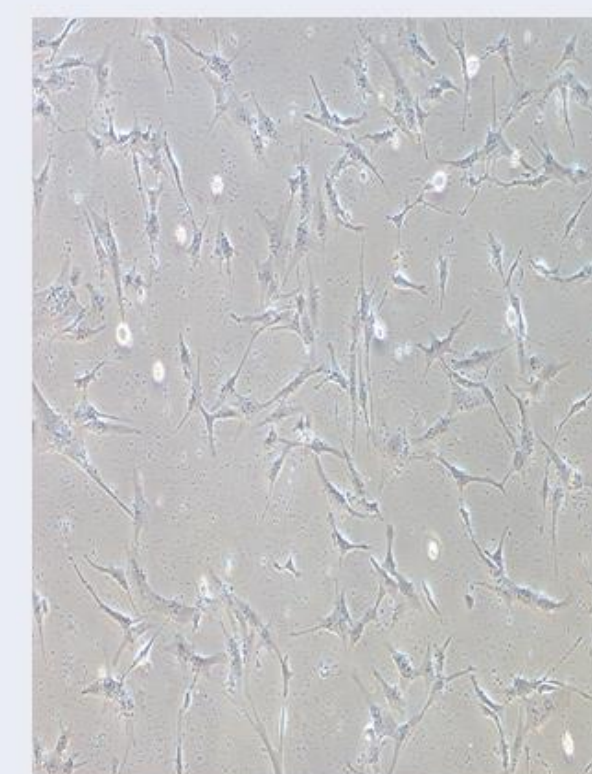
#### CYTOTOXICITY ANALYSIS IN FISH CELL LINE



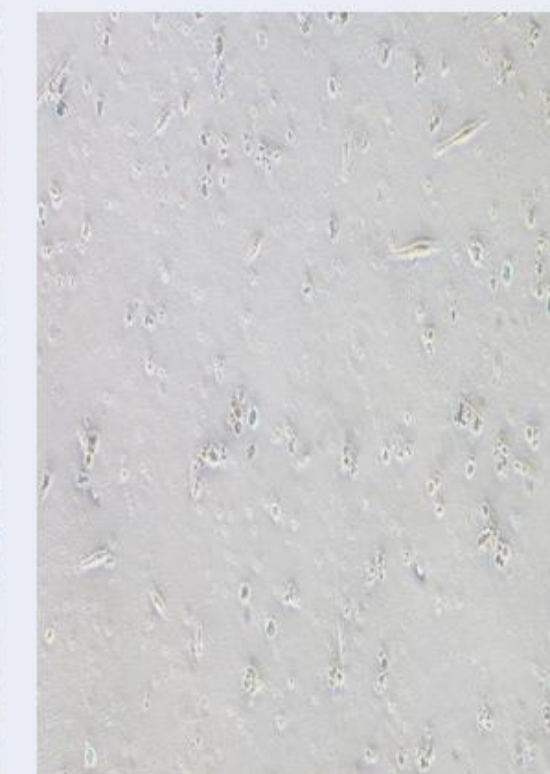
a) Control EM4SpEX



b) EM4SpEx on 2 days post-inoculation with 0.2 μ filtrate (PG+Medium)



c) EM4SpEx on 2 days post-inoculation with 0.2 μ filtrate (PG+Cyflutrin+Medium)



d) EM4SpEx on 2 days post-inoculation with 0.2 μ filtrate (Cyflutrin+Medium)

#### GC/MS-MS results :

40% reduction in cyfluthrin concentration.

#### Discussion

1. Presence of Cyfluthrin was found to enhance bacterial growth as evidenced by increase in OD (600 nm).
2. Cytotoxicity was lower in bacterial treated pesticide suspension.

#### Conclusion

*P. ganghwense*, was found to have bio-degradative ability to utilize the pyrethroid pesticide, Cyfluthrin at optimal growth conditions.

#### References

1. Wang, T., Hu, C., Zhang, R. et al. Mechanism study of cyfluthrin biodegradation by *Photobacterium ganghwense* with comparative metabolomics. *Appl Microbiol Biotechnol* 103, 473–488 (2019) doi:10.1007/s00253-018-9458-7.
2. Grant, R.J., Daniell, T.J., and Betts, W.B. (2002). Isolation and identification of synthetic pyrethroid-degrading bacteria. *J. Appl. Microbiol.* 92, 534–540. doi: 10.1046/j.1365-2672.2002.01558.x

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