

# Testing Local Plants for Quorum Sensing Inhibitors of Bacterial Biofilms

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## ABSTRACT

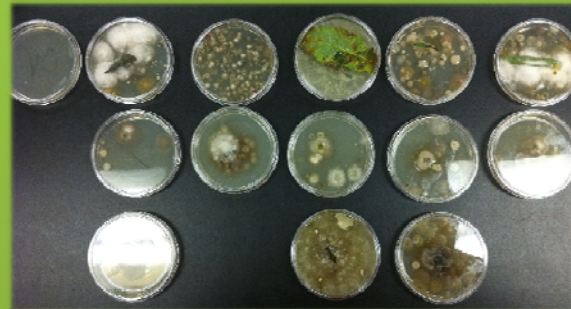
Bacteria use quorum sensing (QS) as a mechanism to control several processes related to cell density. These quorum sensing (QS) signaling molecules allow bacteria to sense the cell density, coordinate their gene expression, form bacterial biofilms, and defend against predation. One strategy for controlling bacteria biofilms is the use of quorum sensing inhibitors (QSI). These QSI molecules have been found in several marine organisms. Recently, there is evidence that plants can interfere with the quorum sensing process. The purpose of this project is to find and test local plants for (QSI). The plants were collected from the ULM campus and the Black Bayou Nature Reserve over two semesters. The plant samples were tested as whole leaf, hole punched leaf, and macerated leaf. They were placed on LB agar and overlaid with the indicator organism *Pseudomonas aureofaciens* 30-84. The indicator organism regulates pigment production and the absence of pigmentation indicates a positive test result. There were 30 plants tested for QSI and none were positive. The results indicate there is a need for further testing in this area.

## INTRODUCTION

In a response to population density, microorganisms are able to regulate specific processes by a mechanism called quorum sensing (QS). QS allows bacteria to increase in diversity and regulate its density. This ability allows bacteria, especially pathogens, to adapt to harsh environments. In order for bacteria to be infectious, their density must reach certain thresholds, quorum. QS is not only used by their own species, but by other bacteria as well. This is how bacteria become resistant to antibiotics. Learning about how quorum sensing works can provide researchers with the knowledge they need in order to prevent uncontrolled pathogenic bacterial growth. Quorum sensing inhibition (QSI) is one method that can be used to treat pathogenic bacteria. QS allows bacteria to communicate via signaling molecules called autoinducers. These autoinducers allow bacteria to express certain genes and grow in population. This growth in population gives the ability for the bacteria to infect and attack the host. Knowing that QS is responsible for population growth, researchers are now trying to find strategies to inhibit QS one of which is QSI. Screening systems have identified several plants that produce quorum sensing inhibitor compounds that block the autoinducer pathways of bacteria. These QSI compounds can then be utilized in antibiotic drugs to repress the growth of bacterial infections.

## RESULTS OF PLANT TESTING

Plant	PsA (- QSI)	Plant	PsA (-QSI)
09-16-10-01	Yes	11-04-10-01	Yes
09-16-10-02	Yes	11-04-10-02	Yes
09-23-10-01	Yes	11-04-10-03	Yes
09-23-10-02	Yes	11-18-10-01	Yes
09-28-10-01	Yes	11-18-10-02	Yes
09-28-10-02	Yes	02-23-11-01	Yes
10-07-10-01	Yes	02-23-11-02	Yes
10-14-10-01	Yes	02-23-11-03	Yes
10-14-10-02	Yes	03-23-11-01	Yes
10-26-10-01	Yes	03-23-11-02	Yes
10-26-10-02	Yes	03-23-11-03	Yes
10-28-10-01	Yes	03-30-11-01	Yes
10-28-10-02	Yes	03-30-11-02	Yes
11-02-10-01	Yes	03-30-11-03	Yes
11-02-10-02	Yes	03-30-11-04	Yes



Example of the entire screening assay



Plant specimen that tested + for QSI yet could not be relocated

## MATERIALS & METHODS

### Plant collection

1. Plant samples were collected at ULM & at Black Bayou Nature Reserve. Photos, coordinates, and qualitative descriptions were used to identify samples
2. Plant samples were taken to lab in plastic bags for further analysis

### Plant screening

1. The screening process requires 6 leaves from each sample
2. Deionized water was used to wash 3 leaves: whole, hole punched, and macerated; the same was done with soapy water
3. We placed each leaf sample on individual LB agar plates.
4. 5  $\mu$ L of *Pseudomonas aureofaciens* was inoculated in the soft agar overlay and poured over the LB agar plates
5. Plates were left to incubate overnight and results were observed the following day

## CONCLUSION

Quorum sensing inhibition of bacteria may prove very applicable in the near future of medical treatments of bacterial infections. Our research goal was to find and identify possible local QSI agents. Although we were unsuccessful in finding said plant sample we believe that such a miraculous specimen must exist.

## ACKNOWLEDGMENTS

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## REFERENCES

1. Fuqua, Clay, Robert J.C. McLean and Leland S. III Pierson. "A Simple Screening Protocol For the Identification of Quorum signal Antagonists." *Journal of Microbial Methods* (2004): 351-360.