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| 氏名                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | OMBIRO GEOFREY SING'OMBE                                                                                              |          |                    |
| 授与した学位                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 博士                                                                                                                    |          |                    |
| 専攻分野の名称                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 農学                                                                                                                    |          |                    |
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| 学位授与の日付                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 平成31年 3月25日                                                                                                           |          |                    |
| 学位授与の要件                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 環境生命科学研究科 農生命科学 専攻<br>(学位規則第4条第1項該当)                                                                                  |          |                    |
| 学位論文の題目                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Study of Specific Growth Inhibitors of <i>Ralstonia solanacearum</i><br>( <i>Ralstonia solanacearum</i> の特異的生育阻害剤の研究) |          |                    |
| 論文審査委員                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 教授 加藤 鎌司                                                                                                              | 教授 一瀬 勇規 | 教授 豊田 和弘 准教授 能年 義輝 |
| 学位論文内容の要旨                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                       |          |                    |
| <p>CHAPTER I</p> <p>In this chapter, I introduce the pathogen bacterial wilt caused by <i>Ralstonia solanacearum</i> in many solanaceous crops. Plant pathogenic bacteria cause huge yield losses in crops globally. Therefore, finding effective and safe bactericides to these pathogens is an immediate challenge. <i>R. solanacearum</i> is one of the most destructive therefore most important bacterial pathogen in plant pathology. <i>R. solanacearum</i> infects over 250 plant species among them 54 dicot and monocot families. Occurrence of bacterial wilt has been mapped to both the tropical and temperate regions of the world. Some of the common control measures include the use of resistant varieties, chemical control, soil fumigation, biological control and plant-derived metabolites. However, these methods have not eradicated the disease requiring alternative control methods.</p> <p>CHAPTER II</p> <p>This chapter describes efforts to screen and identify a compound that can inhibit the growth of <i>R. solanacearum</i>. In this study, we sought new compounds that specifically inhibit the growth of <i>R. solanacearum</i>, and I identified one promising compound, 1-(4-bromophenyl)-6-methoxy-2,3,4,9-tetrahydro-1H-<math>\beta</math>-carboline, which inhibited the growth of <i>R. solanacearum</i> (Rs1002) from a pilot library of 376 chemicals provided from RIKEN, and I designated it as Ralhibitin A. I further obtained its structural analogues and assessed their ability to inhibit Rs1002 growth. Then, I identified five compounds, named Ralhibitins A to E, that specifically inhibit growth of Rs1002 at &gt;5 <math>\mu</math>g/ml final concentration. Ralhibitins also inhibited the growth of <i>Xanthomonas oryzae</i> pv. <i>oryzae</i>, and Ralhibitin E additionally inhibited the growth of <i>X. campestris</i> pv. <i>campestris</i> and Gram-positive bacterium <i>Clavibacter michiganensis</i> subsp. <i>michiganensis</i>.</p> <p>CHAPTER III</p> <p>Efforts to determine <i>in planta</i> activity of Ralhibitin D, which is soluble in ethanol are covered under this chapter. In this study, I investigated <i>in planta</i> activity of Ralhibitin D against tomato seedlings infected with <i>R. solanacearum</i>. Disease symptoms was scored as disease indexes, and the degree of disease suppression was evaluated as control efficiency, which was obtained by the formula 100(C-T)/C, in which C and T are disease indexes of control group and ralhibitin-treated group, respectively. Ralhibitin D significantly suppressed tomato bacterial wilt in a concentration dependent manner. At 56 <math>\mu</math>g/ml, the control efficiency was 87.7% at 10 days post inoculation.</p> <p>CHAPTER IV</p> <p>Most bacteria are tolerant to ralhibitins, and only limited bacteria including <i>R. solanacearum</i> are sensitive to ralhibitins. The spent culture medium from ralhibitin-insensitive bacteria with ralhibitins did not inhibit the growth of <i>R. solanacearum</i>. This result indicates that such insensitive bacteria may be able to inactivate the inhibitory effect of ralhibitins, whereas <i>R. solanacearum</i> lacks such a system.</p> <p>CHAPTER V</p> <p>This is the final chapter of my thesis, and summarizes the results I obtained from chapter II-IV.</p> |                                                                                                                       |          |                    |

## 論文審査結果の要旨

本学位論文では、化合物ライブラリーの中からナス科植物青枯病菌の生育を低濃度で阻害する化合物 1-(4-bromophenyl)-6-methoxy-1,2,3,4-tetrahydro beta-carboline を発見したことに端を発している。本論文では、まず、その化合物のアナログを用いて、生育阻害活性と化学構造との相関を明らかにしている。その結果、本化合物の青枯病菌増殖阻害活性にはハロゲンがパラの位置で結合していることが重要であることを見出した。またメトキシ基は必要ないことが判明した。そのようにして得られた6種の構造類似化合物について、ハロゲンが臭素またはヨウ素の時、最も高い増殖阻害活性を示すことを明らかにし、終濃度 1.25  $\mu\text{g/ml}$  で生育を完全に阻害した。また、これらの化合物は殆どの細菌には増殖阻害効果を示さないが、6種の化合物のうち、フッ素を含む化合物を除き、供試したナス科植物青枯病菌ならびにイネ白葉枯病菌に対し、10  $\mu\text{g/ml}$  以上の濃度で増殖阻害活性を示すことを明らかにした。また、ヨウ素を含む化合物は上述の2菌種に加えて、アブラナ科植物黒腐病菌とグラム陽性のトマト潰瘍病菌の生育を 10  $\mu\text{g/ml}$  の濃度で完全に阻害した。さらに本化合物は熱に安定で、pH7-9の範囲で活性を十分に保持していた。本化合物をトマト幼苗ポットに青枯病菌と共に注入処理をすると青枯病の進展を有意に遅延させた。また、本化合物により生育阻害を受けない数種の細菌に化合物存在下で培養を行い、その培養液を用いて青枯病菌を培養すると青枯病菌は生育可能であった。このことから、生育阻害を受けない菌は本化合物を不活性型に構造変換すると推測した。以上のことより本研究で見出した化合物について、本論文では、その構造と増殖阻害活性との相関関係等、化合物の活性特性を明らかにするとともに、応用面では、青枯病防除材のリード化合物として期待される化合物であることを明らかにした。以上のことから、本論文は博士（農学）に値する論文であると判断した。