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3rd Place Contest Entry: Legume-Rhizobium Symbiosis Phenotypes

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Essay: Use of Leatherby Libraries's Resources

The Leatherby Libraries's extensive digital archive served to be a critical asset in the publication of our dataset, "Legume-Rhizobium symbiosis phenotypes" published on the data repository, Dryad. Over the course of three years, our goal was to assemble a dataset to investigate symbiotic phenotype studies in biological interactions between various rhizobia and legume species. Chapman University's Independent Research (291/491) provided us with a unique experience to gain competency in critical skills necessary for research and to fine-tune our ability in maneuvering the Leatherby Libraries digital archive during the COVID-19 pandemic. As current upperclassmen, we have refined our aptitude in searching for and filtering through various peer-reviewed articles to generate a dataset comprised of a constellation of rhizobia-legume focused scientific literature.

This dataset provided a unique opportunity for us to assume command of the library's arsenal of resources dedicated to conducting effective research. The instructional library session led by Dr. Doug Dechow (Science and Digital Humanities Librarian) equipped us with the necessary skill set to best utilize what the library had to offer. As freshmen, we had little to no experience with reading, much less searching for relevant journal articles. To address this, Dr. Dechow's informational session gave us insight on how to access various databases, input specific keywords, and request assistance for articles that were not readily available. We were able to take advantage of the strategies introduced to us and implement them into our database project. The session with Dr. Dechow anchored the foundation for our project and taught us the fundamental skills necessary for navigating the library website, using boolean search terms, and leveraging its archive of databases. Furthermore, we continue to apply our knowledge not only for research but also for our additional academic endeavors.

Our project was interested in exploring scientific literature between the years of 2009 and 2020 that studied symbiotic phenotypes in the legume-rhizobium interaction. We utilized the Web of Science database, accessed through the Leathery Libraries, to generate a comprehensive list of articles that fell under our specified criteria. Reviewing documentation provided by the library such as those under the "Research and Guides" section provided insight into narrowing the search results. In particular, the "Getting Started: Library Research Strategy" documentation served as the building block for the synthesis of our dataset. It demonstrated how to effectively gather background information on a topic and deconstruct it into core key terms that could be used to generate a catalog of articles that were of interest. We searched for articles with the keywords "rhizob*," "quantification." and "nod*." The '*' character was included in the search terms to conduct a most exhaustive search without typing synonymous words repeatedly such as "rhizobia" and "rhizobium." These key terms were concatenated with the "OR" function to increase our efficiency by removing the need to enter search terms in multiple places. This became the primary methodology for generating our index of scholarly articles.

The objective of our project was to synthesize an easily accessible data set that could provide relevant information on existing legume-rhizobia symbiosis research. Initially, we filtered through the articles between the years of 2009 and 2020 by reading the title and the abstract. Then, each potential article was given a thorough examination for indexing. Within the abstract, we specifically sought out mentions of plant growth-promoting rhizobacteria, rhizobia and legume species, and nodule/nodulation. After the initial round of filtering, we then assessed articles for features of interest including growth rate, density, colony, shoot dry weight, nodule dry weight, and nodules per plant. If the article contained any of the following features, they were marked on a separate spreadsheet. Every round of filtering involved cross-checking by members of the project. This process of coding helped us conduct an accurate dataset and further expanded our knowledge of different rhizobia and legume species and reinforced key concepts.

The Leatherby Libraries and its resources have been paramount to our competency as undergraduate researchers and to the development of our dataset. Publishing this dataset has provided us with extensive experience in evaluating various scientific literature and has highlighted the significance of accessible library resources. Our time dedicated to this project has equipped us with the knowledge necessary to pursue additional endeavors in the future. We hope that this dataset will prove to be useful for fellow peers and researchers who share a deep interest in exploring the field of plant-bacterial interactions biology. The publication of the dataset has shown that the digital and physical resources that Leatherby Library provides can be fully utilized to investigate meaningful questions in diverse academic disciplines.

CSE Bibliography: Selected List

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Germany. European Journal of Agronomy 72:38–46.

Summary of Research Project: Legume-Rhizobium symbiosis phenotypes

Our project aimed to examine scientific literature and produce an accurate dataset reflecting the various legume-rhizobium phenotypes observed in prior research. We coded articles published between January 1, 2009, and September 30, 2020, based on the presence of legume or rhizobium phenotypes. Our focus concentrated on papers that quantified rhizobia and identified relevant legume phenotypes. We used the Web of Science database through Chapman University's Leatherby Libraries to search for legume-rhizobium symbiosis articles to access necessary literature. Within the database, keywords Topic = (rhiz* OR bradyrhiz* OR mesorhiz* OR sinorhiz* OR ensifer*) AND Topic = (count* OR form* OR quant* OR estimat*) AND Topic = nod* were searched in the engine for desired articles. Initially yielding 2,440 papers, the author, title, source, year of publication, and DOI were exported via Web of Science. Then, the filtering of journal articles began by solely examining the titles and abstracts. Articles that included mentions of plant growth-promoting rhizobacteria, rhizobia and legume species, and nodule/nodulation within the abstract were downloaded for coding. Subsequently, we read through the literature to identify 25 different legume-rhizobium phenotypes including: "Rhizobia Growth or Growth Rate," "Plant Growth or Dry Weight or Fresh Weight, "Root Dry Weight or Density," "Root Branching or Length," Rhizobia Colony Morphology," "Rhizobia Number," "Shoot Dry Weight," "Nodule Dry Weight," "Number of Nodules Per Plant," "Number of Nodules," "Acetylene Reduction," "Isotopic 15N," "Biomass," "Chlorophyll," "Roots Per Plant," "Leaf Number or Weight," "Shoot Length," "Nitrogen Fixation," "Nodule Occupancy or Diversity," "Seed Count or Production," "Nodule Structure," "Shoot Number," "Root/Shoot Ratio," "Branch Dry Weight," and "Nodule Color." In total, 771 articles were analyzed for relevant phenotypes.