

Phaseolus vulgaris and Vesicular-Arbuscular Mycorrhizal Fungi in the
Ecuadorean Andes

A THESIS
SUBMITTED TO THE FACULTY OF THE GRADUATED SCHOOL
OF THE UNIVERSITY OF MINNESOTA
BY

KATHRYN JOANNE DRAEGER

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
MASTER OF SCIENCE

August, 1993

ACKNOWLEDGEMENTS

Through all my years in the Soil Science department and in Ecuador I wrote and rewrote, in my mind, the acknowledgements and dedication of this work. It is with much emotion that I would foremost like to thank my mentor and advisor, Dr. Peter Graham. Peter's enthusiasm and love for his work have been an inspiration to me as an example of how one can find real fulfillment in their avocation. I attribute much of my professional development to the encouragement I received from Peter who has always shown confidence in my abilities as a scientist. Our different views have been as much of a forming factor in my education as our similarities. Thank you Peter.

The home I found in the Soil Science department is one that I am not eager to leave. I found in this department a wealth of real individuals and a safe and constant environment. I have had the pleasure to work with people from the four corners of the planet and they have enriched my life beyond measure. Those friends that I found within this department include, but are not limited to; Patrick Jjemba, Evelyn Fernandez, Consuelo Estevez, Lori Daane, Constanza Montealegre, Gustavo Bernal, Qing Zhang, Barbara Fischer, Mark Ferrey, Deborah Allan, Ed Nater, Bonnie and Mark Thompson, and Mark Zumwinkle.

The MacArthur Interdisciplinary Program on Peace and International Cooperation provided encouragement for multidisciplinary collaboration and partial financial support for this project. Thanks are offered to Drs. Frank Pflieger and David Sylvia for their help with aspects of the mycorrhizae work.

Where would I be without the support and love of my family and friends? That I don't care to consider. And so I am grateful to my parents, Robert and Arlene Draeger and Leona Humphrey, and to my sister Kelley and sweet niece Kayla Leeper and aunt Carolyn McDonald.

And finally to the friends and loves who have held my hand throughout this journey. What a long and wonderful trip it has been! Char Voight has been my confidant, companion, comforter and esteemed friend since I began this thesis and joined me for this work in Ecuador. Dear friends who have offered their

encouragement and support are Cindy Hale, Paul Fehrenbach, Barry Greenwald, Beth Doerfer, Pat Schense, Ronnit Bendavid-Val, Cheryl Aaserud, Lisa McDonald and Arie Vana, and many more, who while not named here are dear in my heart.

Finalmente yo quiero decir muchismas gracias a la gente del Ecuador y especialmente a los de la Estacion Experiemental Santa Catalina. Ustedes hicieron una epoca de mi vida tan feliz y tan interesante. Ustedes me enseñaron como bailar un poco mejor en ese mundo tan rico. Tambien debo mucho a los que me ayudaron cuando estuve con ustedes- especialmente Yolanda Mora, Wilson Escudero, Guillermo Castro, Edwin Lopez, Consuelo Estevez, Claudia Narváez, Diego Gangotena, Pepe Ochoa e Irma Nicolalde. Quiero dedicar esta tesis al Sr. Flores y los agricultores del Ecuador para quienes yo hize el trabajo. Gracias.