

ADVENTURES IN PLANT NITROGEN METABOLISM: FROM SIGNALING TO DEFENSE

Polacco, J.C.^{1,2} and Carlini, C.R.²

¹Biochemistry Dept.; University of Missouri-Columbia, USA; ²Department of Biophysics and Center of Biotechnology, Universidade Federal do Rio Grande do Sul, Porto Alegre
RS

INTRODUCTION: Nitrogen (N) is generally the most limiting plant mineral. To acquire N, plants employ physiological and developmental strategies and unique associations with bacteria, fungi, and even ants. This N must be conserved and recycled. For example, urea released from purine and arginine turnover is recycled by urease to ammonia. Terrestrial mammals, however, “jettison” excess N as urea. The hydrolysis of animal urea by microbial ureases is an important factor in various pathogenesis. **OBJECTIVES:** Do the abundant seed ureases of soybean (SBU) and jackbean (JBU) play defense roles, either as catalysts or toxic proteins? **RESULTS:** Genetic elimination of SBU did not affect urea assimilation, consistent with a role in defense. SBU and related proteins from jackbean were indeed found to be insecticidal and fungitoxic, as well as potentially involved in signaling in animal cells-- properties that do not depend on ureolytic activity. However, urea generation and assimilation pathways may generate small N-rich compounds involved in signaling and defense. Arginine is an important N storage and transport molecule; arginase action releases half the N of arginine as urea. We present evidence that arginine is a potential generator, not only of urea, but of nitric oxide (NO). Arginase disruption mutants of Arabidopsis appear to produce more NO and to be more auxin-responsive in formation of lateral and adventitious roots. NO is a potential mediator of defense responses and this role will be examined in the arginase disruption mutants. **CONCLUSION:** Urea generation, and the ureases, need to be reexamined in plant N assimilation, signaling and defense.

Key words: Urease, Urea, NO, Arginine

Support: CAPES, CNPq, FABERGS and Missouri NC SB