

## Effect of Nitrogen Addition on Population Establishment of the Arundo Armored Scale *Rhizaspidotus donacis*

P. J. Moran and J. A. Goolsby

U.S. Department of Agriculture, Agricultural Research Service, Beneficial Insects Research Unit, 2413 E Highway 83, Weslaco, TX 78596 USA Patrick.Moran@ars.usda.gov  
John.Goolsby@ars.usda.gov

### Abstract

Plant nitrogen content influences suitability for herbivorous insects through direct impacts on insect nutrient uptake, and physiological effects on plant tissue toughness, growth, and production of chemical defenses or feeding stimulants. Specialist insects released for biological weed control, especially agents that create or manipulate nutrient sinks, may benefit from positive interactions between nitrogen fertilization and biocontrol agent development, survival, and/or reproduction, which could enhance mass-production or improve field establishment. We examined the influence of urea addition on population establishment and reproduction of the arundo armored scale *Rhizaspidotus donacis* (Leonardi) (Hemiptera: Diaspididae), released in 2011 in the Lower Rio Grande Basin of southern Texas (USA) and northern Mexico to control giant reed (*Arundo donax* L.), an exotic, invasive giant grass in North and South America, South Africa and Australia. Rhizomes of *A. donax* were fertilized with urea solution once immediately before and again one month after release of neonate crawlers (rate = 67 kg ha<sup>-1</sup> urea). Six months after crawler release in a quarantine lab study, mature adult females and combined females and adult males (empty male scale covers) were 40% more abundant on fertilized than unfertilized rhizomes (ANOVA,  $F = 71.9$ ,  $df = 1,6$ ,  $P = 0.0001$ ), and females reared on fertilized rhizomes produced 33% more crawlers ( $F = 9.4$ ,  $df = 1,5$ ,  $P = 0.038$ ). However, settling of second-generation crawlers was 40% lower on fertilized rhizomes ( $F = 83.1$ ,  $df = 1,3$ ,  $P = 0.003$ ), due likely to limited availability of settling locations. In large greenhouse tubs after six months, adult counts and female reproduction did not differ on the basis of fertilization, but second-generation settling was 1.5- to 3.5-fold higher on rhizomes in fertilized tubs ( $F = 583$ ,  $df = 1,5$ ,  $P < 0.001$ ), as crawler settling locations were not limited. Inconsistent lab and greenhouse results likely reflect different growth conditions, but in no case did fertilization have a directly negative effect on population development of the arundo armored scale. Field studies are underway to further examine interactions between tissue nitrogen in *A. donax* and establishment of this novel biological control agent.