Newly Mated Queen Adoption & Polygyny

Robert K. Vander Meer
USDA - ARS, Gainesville, FL
bobvm@nervm.nerdc.ufl.edu
& Leanne E. Alonso,
(currently) Xerces Society, Springfield, VA.

Abstract:
There are several ways in which polygynous Solenopsis invicta colonies could originate. (A) Multiple newly mated queens are known to often attempt to found colonies in groups. However, soon after the first workers eclose all but one queen is executed creating a monogynous colony. (B) Multiple monogynous colonies could fuse and maintain more than one queen, but monogynous colonies are territorial and there is no evidence that fusion between queenright monogynous S. invicta colonies occurs. (C) Newly mated queens could be adopted by queenright monogynous colonies; however, conspecific worker aggression from queenright colonies extends to newly mated queens. In laboratory experiments 100% of introduced newly mated queens were executed by monogynous workers. (D) Male and female sexuals within a monogynous colony could mate within the nest (intranidal mating), thus creating a polygynous colony. There is no evidence that supports intranidal mating, and it is known that queens in United States polygyne colonies are unrelated. None of the above appear to explain polygynous S. invicta in the United States.

We suggest a mechanism for the initiation of polygyny that involves adoption of NMQs into queenless worker groups. Insight into the mechanism of polygyny formation in fire ants came from the discovery that highly aggressive and territorial fire ant workers from monogynous colonies quickly become less aggressive toward conspecifics after they lose their queen. In addition, these queenless worker groups readily fuse to form new colony groups that contain several matrilines and patrilines, as are found in polygynous colonies. Queenless polygynous and monogynous colony workers, as well as fused monogynous worker groups adopt newly mated fire ant queens (normally executed by workers with queens). We propose that the probability for development of polygynous populations increases with the formation of population-wide queenless worker groups. Chemical treatment of soil, controlled burns, and fire ant toxic baits could lead to the population-wide formation of queenless worker groups, providing the conditions for the development of a polygynous population. We used toxic baits to test our working hypothesis that formation of multiple queenless worker groups would promote the development of polygyny within a monogynous population in the field. Of five replicate monogynous field plots treated with bait toxicant (hydramethylnon) four developed patches of polygynous colonies within 54 weeks after treatment, whereas all associated controls maintained their monogynous status. This is the first time that an association has been demonstrated between bait treatment and the development of polygynous fire ant colonies.