Mysterious foraging of Pharaoh ant *Monomorium pharaonis*

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Abstract

The Pharaoh ants *Monomorium pharaonis* were offered freshly dead mosquitoes and fragments of biscuits on the floor of a domestic house locating at Garia, West Bengal, India to note the foraging behaviour in respect to the foods offered. It is revealed that these ants are habituated to carry the food individually as well as in groups. In cases of individual food-carrying strategy they were seen to tear the mosquito and the biscuit fragments into small pieces but in group strategy either the mosquito specimens or the biscuit fragments were taken to the nest by pulling and pushing act. However, it is not clear, under what circumstances they decide to carry the food as such in a group or in small particles individually.

Key words: Ants *Monomorium pharaonis*, Foraging, Food-carrying strategy

Introduction

The Pharaoh ants *Monomorium pharaonis* is a serious pest in many parts of the globe (Lee and Robinson, 2001). Various attempts are being made to control these insects (Vail *et al.,* 1996; Lee, 2000, 2002, Lee and Lee, 2002, Lee *et al.,* 2003, Bajomi *et al.,* 2005). Moreover, these ants have been reported to serve as mechanical vector for pathogenic microorganism (Lee, 2002). These small ants (2mm) utilize three types of pheromones in course of foraging. One is long lasting attractive chemical which is very much effective to develop a trail network. Even, these ants are able to follow the said trail after few days (Jackson et al 2006). Moreover, these ants are unique in the sense that they are habituated to use both attractive and repellent pheromones in the decision-making regarding foraging. Keeping these behavioural strategy regarding foraging in mind we offered different kinds of food on the floor of a house to note the foraging in *M. pharaonis.* These ants exhibited different kinds of behaviour in respect to feeding and/or procuring of different foods offered to them.

Materials and Methods

We offered freshly dead mosquitoes and fragments of biscuits to the ants *M. pharaonis* on the floor of a domestic room locating at Garia, Kolkata, India in 25 trials. In each trial, in some cases only mosquitoes were offered while in other trials only biscuit fragments were supplied, though many trials were performed by offering both mosquito and biscuit fragments together. The trials were performed both in day and night hours during summer in 2015. In all cases due attention was paid to note the time of arrival of the ants at the food-supplied spots and the subsequent behaviours

exhibited by them in course of utilization of these foods. Though the number of offered mosquitoes and biscuit fragments varied with the trials in no case more than 10 mosquitoes or biscuit fragments were offered in a trial.

Results

The ants *Monomorium pharaonis* were seen to locate the supplied foods between 1 to 86 minutes following deposition of the same on the floor of the room. Of the 25 trials, foods were eaten instantly at the supplied site in 7 trials while the foods offered in the remaining trials were carried by the ants to their nest. In case of feeding on the mosquitoes they were seen to cut the mosquito into different parts- viz. wings, legs, head, thorax, abdomen etc. After feeding at the spot they were seen to carry the legs and wings to a distant place to deposit the same there. In other cases they were seen to carry a mosquito in a group to the nest.

In case of feeding on the biscuit fragments they were seen to split the fragments into small pieces prior to consumption of the same. Also, they applied group-carrying strategy to take away the biscuit fragments of suitable sizes. Invariably, in all cases all the larger-sized biscuit fragments were fragmented further into small pieces to enable a single or 2-4 individuals to carry the same to the nest. Of the supplied 217 mosquitoes 63 were cut into pieces at the supplied site to ensure feeding at the site while 154 mosquito specimens were carried as such to the nest. The supplied biscuit fragments irrespective of sizes were cut into smaller pieces to carry the same to the nest.

Discussion

Ants are habituated to collect their food from different sources in their foraging area. But, the food-carrying strategy varies with the species. Usually, large species carry food individually or by working as a team of 2 or more ants depending upon the size of the food particle. On the contrary, in cases of small sized ant species food carrying strategy is effected by active participation of dozens of ants in a group. Of course, they have also developed the art to tear the food into pieces and then the fragmented food particle is carried by an ant individually to the nest (http://ant.edb.miyakyo-u.ac.jp). As the ants *M. pharaonis* are very small in size they have rightly followed the group-carrying and individual-carrying food strategies. However, question arises regarding the situation for application of such strategies by the ants.

From the results of the present investigation it is clear that *M. pharaonis* applied both types of food-carrying strategies to carry the mosquito as well as biscuit fragments which were offered to them. Since the offered mosquito specimens were almost of equal weight and the *M. pharaonis* had no problem to carry the same to the nest then, why in other occasions they cut the mosquitoes into pieces ? Also, why they considered it wise to carry the wings and legs to a distant place to leave these there ? This query is equally applicable for biscuit fragments also. Because, why ants preferred to tear the biscuit fragments instead of carrying the same through the application of group strategy, to the nest ?

It seems that ants prefer individual foraging over group foraging. Because, this may save time and energy of the colony members. If they decide that a large food particle be taken to the nest through the application of group strategy then the individual must wait one after another at the site until the required number ant individuals are assembled at the site. To avoid this, it would be wise to tear the food into small pieces so as to enable an ant individual to carry the same instantly to the nest alone. As, in the present study the ants exhibited both kinds of food-carrying strategies it is intriguing to ascertain the circumstances that induce the ants to follow a particular food-carrying strategy at a particular time point. It may be that, the tearing of food would take time and in the

meantime competing ant or other animal species may try to take away the said food. So, it is better to follow the group-strategy. This means, *M. pharaonis* are able to guess the occurrence of competing species in respect to the food source in question. Secondly, it may so happen that the food source is far away from the nest and individual foraging would be time consuming process. The third option may be the availability of fellow worker-members at the nest. If for any reason sufficient workers will not be available to apply group-strategy to carry a food then the only option to tear the food and provide small fragments of the same to the fellow workers to carry a piece individually, safely to the nest.

There exists ample information on the foraging strategies of ants (Goss *et al.,*1989a, b; Traniello, 1989; Portha *et al.,* 2002; Jackson *et al.,* 2004; Prabhakar et al. 2012; Schultheiss and Nooten 2013; Czaczkes and Ratnieks, 2013; Hashimoto and Yamane, 2014; McCreery and Breed 2014; Li *et al.,* 2014; Naskar and Raut, 2014a,b,c, 2015a,b,c,d,e,f) but no explanations regarding choice of strategies by the ants is on record. It is really a matter of investigation in respect to sizes of ant species for a definite conclusion on the aspects of application of food-carrying strategy by the ants.

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