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AVAILABLE FOOD AND ANTS' RESPONSE

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ABSTRACT

Ants are habituated to search food here and there in their foraging ground. To note their response in respect to available foods various types of foods in different sizes and numbers were offered at certain sites of their foraging ground in Garia, Kolkata, India. It is observed that both the ant species *Pheidole roberti* and *Paratrechina longicornis* started carrying the food particles instantly to the nest when they came across the sugar cubes 10 in number, offered at the site. But, in cases of availability of sugar cubes or biscuit fragments or dry fish fragments or nut particles or freshly dead mosquitoes or rice grains or papad fragments either separately or together more than 10 in number they were seen to examine the food particles at the offered sites and then moved quickly to the nest to invite the nest-mates with a view to procure these food particles.

KEYWORDS: ants, foods, response, foraging

INTRODUCTION

It is known that ants' move here and there in the foraging ground in search of food (Orians and Pearson, 1979 ; Goss et al. , 1989a, b ; Portha et al., 2002; Prabhakar et al., 2012 ; Schultheiss and Nooten, 2013, Loreto et al., 2013; Li et al., 2014; Naskar and Raut , 2014a, b, c, 2015a, b). They, in course of searching either accidentally or being triggered by cues come across the food. Thereafter, they try to develop the mechanism to carry these foods to their nest. But, in fact it is not known what the ants do just coming in contact of the food. Keeping in view of the valuable information regarding foraging activity of the ants (Beckers et al., 1990 ; Crist and Macmahon, 1991 ; Sengupta et al., 2010 ; Loreto et al. 2013 ; Li et al, 2014 ; Naskar and Raut, 2014c, 2015a, b) we designed experiments by offering different kinds of food particles in different numbers at different sites of the foraging ground of the ants occurring in Garia, Kolkata, India to note the response-behaviour of the ants in respect to the availability of foods. As the ants *Pheidole roberti* and *Paratrechina longicornis* were involved in our experimental set-up we had the opportunity to observe the food-response behaviours in their natural foraging

ground. The behavioural responses noted by as are worth reporting.

MATERIALS AND METHODS

We designed the following 88 trials in the foraging ground of the ants adjacent to a domestic house at Garia, Kolkata, India.

(A) Trials 1-50 : 10 sugar cubes were supplied at different sites of the foraging ground in each trial on different dates.

(B) Trials 51-68 : In each trial food particles of any one kind, in different sizes, were offered to the ants at different sites as per following specifications :

- Trials 51 : 20 sugar cubes
- Trials 52 : 30 sugar cubes
- Trials 53 : 20 dry fish fragments
- Trials 54 : 40 sugar cubes
- Trials 55 : 40 dry fish fragments
- Trials 56 : 40 biscuit fragments
- Trials 57 : 50 nut particles
- Trials 58 : 60 papad fragments
- Trials 59 : 70 sugar cubes

Trials 60 : 80 dry fish fragments
Trials 61 : 90 sugar cubes
Trials 62 : 100 biscuit fragments
Trials 63 : 130 sugar cubes
Trials 64 : 150 dry fish fragments
Trials 65 : 160 biscuit fragments
Trials 66 : 170 papad fragments
Trials 67 : Innumerable sugar cubes
Trials 68 : Innumerable biscuit fragments

(C) Trials 69-88 : In each of the following 20 trials food particles were offered at the site as per specifications mentioned:

Trials 69 : 20 sugar cubes + 12 rice grains
Trials 70 : 30 sugar cubes + 30 dry fish fragments
Trials 71 : 30 sugar cubes + 30 nut particles
Trials 72 : 60 sugar cubes + 30 biscuit fragments + 30 nut particles + 3 freshly dead mosquitoes
Trials 73 : 60 sugar cubes + 30 dry fish fragments
Trials 74 : 30 sugar cubes + 30 dry fish fragments + 30 papad fragments
Trials 75 : 30 sugar cubes + 30 dry fish fragments + 30 biscuit fragments + 30 papad fragments
Trials 76 : 30 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments
Trials 77 : 30 sugar cubes + 30 nut particles + 30 dry fish fragments + 30 biscuit fragments
Trials 78 : 30 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments
Trials 79 : 30 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments
Trials 80 : 30 sugar cubes + 30 biscuit fragments + 30 papad fragments + 30 dry fish fragments + 17 freshly dead mosquitoes
Trials 81 : 60 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments + 3 freshly dead mosquitoes
Trials 82 : 80 biscuit fragments + 60 sugar cubes + 30 nut particles + 30 dry fish fragments + 10 freshly dead mosquitoes
Trials 83 : 80 dry fish fragments + 60 sugar cubes + 30 biscuit fragments + 30 nut particles
Trials 84 : 60 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments
Trials 85 : 80 sugar cubes + 60 biscuit fragments + 40 dry fish fragments + 15 freshly

dead mosquitoes
Trials 86 : 30 sugar cubes + 30 dry fish fragments + 30 biscuit fragments + 30 nut particles + 30 papad fragments
Trials 87 : 30 sugar cubes + 30 biscuit fragments + 30 papad fragments + 30 dry fish fragments + 30 nut particles
Trials 88 : 60 sugar cubes + 30 nut particles + 30 biscuit fragments + 30 dry fish fragments + 16 freshly dead mosquitoes

Trials were made both in day and night hours in dry sunny days. In all cases due attention was paid to note the activity of the ants while they were approaching the supplied foods.

RESULTS

In trials 1-50 the ants *Pheidole roberti* and *Paratrechina longicornis* were seen to examine a piece of sugar cube and then and then took the liberty to carry the same to the nest. Initially, in most cases, though food-carrying act was effected by only one ant individual involvement of few more individuals, depending upon the time of arrival of other individuals, was also common in many cases. Irrespective of the trials made and the ant species involved with the interactions the supplied food particles were carried to the nest mostly in respect to the chance of contact by the foragers with the food particles. The ants irrespective of species did not move to the nest to inform the nest-mates for collection of the food offered at the site.

In trial 51-68 the ant individuals while came across the food was seen to examine the food particles, usually 2-6 particles hurriedly and then moved to the nest to inform the fellow members of the colony to ensure collection of the food from the offering site. Invariably, within a few minutes many ants were seen marching towards the food source. Thereafter, they were seen to carry the food particles either individually or in groups to the nest.

In trials 69-88, irrespective of the number of food particles offered, the ant individual, after coming in contact of the same checked several particles either of same kind or of different kinds (Table 1) hurriedly. Thereafter it moved to the nest to inform the nest mates regarding the food-source so as to enable them to collect the same. In all cases food-carrying act was effected immediately after the foragers were seen to touch the food materials.

Though in some cases a tussle between the members of *Pheidole roberti* and *Paratrechina longicornis* was common event ultimately the offered food particles were procured by the ants of either species.

DISCUSSION

From the results it appears that ants are very cautious regarding cost-benefit effects in respect to foraging activities. Apparently it seems that ants wander here and there in search of food but actually, they are highly adapted how to conserve energy and to collect food irrespective of circumstances. It is evident that the ants *Pheidole roberti* and *Paratrechina longicornis* did not move to the nest to inform the fellow members for collection of sugar cubes from the sites while there were only 10 sugar cubes. Under such a situation they preferred to carry a sugar cube to the nest anticipating that these sugar cubes may be taken away by other foragers of any other ant species. Therefore, the strategy, to inform the nest-mates and the arrival of nest-mates to the site would prove futile, of course, at the cost of loss of energy for travelling as well as for production and deposition of pheromone (Beckers et al., 1992 ; Evison et al., 2008 ; Bernadou and Fourcassie, 2008 ; Reid et al., 2011 ; Loreto et al., 2013). This could be justified from their habit of examination of food particles and to move quickly to the nest to invite other members for collection of the food in cases of availability of food particles in large numbers (at least more than 10) of different varieties. Here, benefit lies with the collection of available food particles as much as possible. It is most likely that a scout of other ant species may visit the said food source when the scout of another ant species is running to the nest to invite the nest-mates. Thus, there exists every probability of getting some of the food particles from the site even if the foragers of other ant species assembled at the site. Of course, in that case tussle under certain circumstances is inevitable (Naskar and Raut, 2015b). Even, under such a situation there exists probability of getting few food particles by the competitors. That is, benefit is almost assured. On the contrary, if there exists no competition between the species then member of both the species would try their level best to procure as many as food particles to the nest. Though distance between nest and the site of food source regulates the rate of collection of food particles it is the number of accumulated food particles of a site that determines the food-procurement success.

In cases of multiple food sources when the numbers of food particles are high the ants would be benefited at a maximum level. Because, initially one species may prefer one kind of food while others may collect other kinds of food from the same source. This may so happen as per need of the colony (Portha et al. , 2002). Thus tussle in many cases may not create problem in foraging. The ants wander at random but they do not spent a second unwisely after getting information in respect to occurrence of preferred foods. This is well evident from the fact of examination of one or two or three types of food particles of different varieties in presence of several types of foods. This indicates that the ants are assured of presence of many particles of a preferred food. So, it is better to move to the nest to inform the nest-mates as early as possible. Therefore, in cases of supply of different kinds of foods the ants were never seen to examine all types of foods occurring at the site. That is, the ants are able to estimate the quantity of the food. Otherwise, it would have not been possible for the ants to take the risk of unwise spent of energy on way of travelling and deposition of pheromones. It is sure that the ants are able to estimate the volume of the food (Mailleux et al. , 2000). Perhaps, this kind of intelligence have enabled ants to achieve foraging success with no risk. Thus, it is concluded that the ants' behavioural adaptation in respect to food collection under different situations is, undoubtedly, a unique device with a view to utilize the resource at maximum level.

CONCLUSION

Ants, irrespective of species have developed the art of foraging to such an extent that procurement of foods is assured under any and all circumstances.

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Table 1. Response of ants in respect to availability of food particles belonging to different varieties, as regards to the trials made in the foraging ground. [* response by *Pheidole roberti*, ** response by *Paratrechina longicornis*].

| Trial No. | | Sugar cube | Dry fish fragment | Biscuit fragment | Nut particle | Papad fragment | Rice grain | Freshly dead mosquito |
|-----------|------------|------------|-------------------|------------------|--------------|----------------|------------|-----------------------|
| 69 | Supplied | 20 | | | | | 12 | |
| | Examined* | 3 | | | | | 0 | |
| 70 | Supplied | 30 | 30 | | | | | |
| | Examined* | 3 | 2 | | | | | |
| 71 | Supplied | 30 | 30 | | | | | |
| | Examined* | 3 | 3 | | | | | |
| 72 | Supplied | 60 | | 30 | 30 | | | 3 |
| | Examined* | 3 | | 0 | 2 | | | 0 |
| 73 | Supplied | 60 | 30 | | | | | |
| | Examined* | 3 | 3 | | | | | |
| 74 | Supplied | 30 | 30 | | | 30 | | |
| | Examined* | 4 | 2 | | | 3 | | |
| 75 | Supplied | 30 | 30 | 30 | | 30 | | |
| | Examined** | 2 | 2 | 0 | | 0 | | |
| 76 | Supplied | 30 | 30 | 30 | 30 | | | |
| | Examined** | 1 | 0 | 2 | 6 | | | |
| 77 | Supplied | 30 | 30 | 30 | 30 | | | |
| | Examined** | 2 | 1 | 1 | 2 | | | |
| 78 | Supplied | 30 | 30 | 30 | 30 | | | |
| | Examined** | 2 | 0 | 2 | 6 | | | |
| 79 | Supplied | 30 | 30 | 30 | 30 | | | |
| | Examined* | 2 | 2 | 0 | 2 | | | |
| 80 | Supplied | 30 | 30 | 30 | | 30 | | 17 |
| | Examined** | 2 | 0 | 0 | | 0 | | 3 |
| 81 | Supplied | 60 | 30 | 30 | 30 | | | 3 |
| | Examined** | 3 | 1 | 2 | 0 | | | 0 |
| 82 | Supplied | 60 | 30 | 80 | 30 | | | 10 |
| | Examined** | 5 | 2 | 0 | 0 | | | 0 |
| 83 | Supplied | 60 | 30 | 30 | 30 | | | 3 |
| | Examined** | 3 | 1 | 2 | 1 | | | 1 |
| 84 | Supplied | 60 | 30 | 30 | 30 | | | |
| | Examined** | 0 | 0 | 3 | 6 | | | |
| 85 | Supplied | 80 | 30 | 60 | 30 | | | |
| | Examined* | 3 | 0 | 2 | 0 | | | |
| 86 | Supplied | 30 | 30 | 30 | 30 | 30 | | |
| | Examined* | 0 | 2 | 4 | 3 | 0 | | |
| 87 | Supplied | 30 | 30 | 30 | 30 | 30 | | |
| | Examined** | 1 | 4 | 3 | 0 | 0 | | |
| 88 | Supplied | 60 | 30 | 30 | 30 | | | 16 |
| | Examined** | 4 | 0 | 0 | 0 | | | 0 |