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Research Note

Effect of food supplements on developmental time of *Dinarmus basalis* (Rond.) (Hymenoptera: Pteromalidae)

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ABSTRACT: ***Dinarmus basalis*** **(Rond.) is a larval-pupal ectoparasitoid of** ***Callosobruchus chinensis*** **(Linnaeus) and** ***C. maculatus*** **(Fabricius). Foods like honey, sugarcane, yeast, agar, and egg yolk, affected the developmental time from egg to adult emergence of the parasitoid** ***Dinarmus*** **differently on** ***C. chinensis*** **and** ***C. maculatus*****. Developmental period also varied among sexes of the parasitoid, the male completed development within 10.41 ± 0.04 days, but the female developed in 11.04 ± 0.08 days when parasitizing** ***C. chinensis*** **and feeding on honey. On** ***C. maculatus*** **and honey, the male** ***D. basalis*** **completed development within 11.16 ± 0.07 days and female took 12.09 ± 0.09 days to complete development. Honey was found to be most effective and agar was less effective host food, in terms of the developmental time of** ***D. basalis*****.**

KEY WORDS: *Dinarmus basalis*, food supplements, developmental time, *Callosobruchus chinensis*, *C. maculatus*

The biotic potential of any insect is influenced by certain major factors like food, temperature, relative humidity and photoperiod. The parasitoids require available food for successful reproduction (Browing and Oatman, 1981).

The wasps need nutritive compounds similar to other insects, which should contain amino acid, vitamins, minerals, cholesterol and a hexose monosaccharide (House, 1977). In nature, the nectars, pollen, honeydew and other plant exudates are the major food sources for adult hymenopteran parasitoids (Leius, 1961a, b), but in the laboratory, honey and sugar solutions are used as substitute foods (De Bach and White, 1960). A mixture by equal parts of honey and water proved to be satisfactory food item (Ghani and Sweetman, 1955). Dextrose, fructose, lactose, maltose and sucrose solutions can also be used as adult diets (Narayanan and Mokherjee, 1956). The present experiment was conducted to assess the influence of different food supplements on the developmental time of *Dinarmus basalis* against *Callosobruchus chinensis* and *C. maculatus*.

Callosobruchus chinensis and *C. maculatus*, and the parasitoid, *D. basalis* were collected from the stock culture of the Institute of Biological Sciences, University of Rajshahi, Bangladesh, maintained in control temperature (CT, 30 ± 0.5°C) room since ten years. Upon emergence, healthy male and female parasitoids were kept together in small Petri-dishes (4 cm diam) for 16-24 hours to allow mating. Subsequently, each female was placed in a

Petri-dish with 50 infested seeds with 12-15-day-old *C. chinensis*. A similar experiment was conducted with 50 infested seeds with 20-22-day-old *C. maculatus* for each mated female. Each female was supplied with the following food supplements, such as honey, sugarcane, egg yolk, yeast, host plus agar, and host without food supplement (control).

Honey, egg yolk, yeast and agar were mixed with 50 per cent water and provided separately on a piece of filter paper (1 x 1 x 0.5 cm approximately) that was changed every 24 hours. A piece of such treated filter paper was kept with a mated female in the Petri-dish.

Parasitized seeds were changed daily. The female parasitoids were provided with fresh un-parasitized fourth instar host larvae throughout their life. Parasitized seeds were kept in individual vials for 20 days to count the developmental time of *D. basalis*. Each treatment was replicated 15 times having one female/replication.

The relationship between different supplemental foods and developmental time of *D. basalis* varied remarkably when reared on *C. chinensis* and *C. maculatus* infested mung seed. The supplemental foods reduced the mean developmental time from egg to adult emergence of *D. basalis* (Table 1) and the effect differed significantly in two hosts ($F = 227.09$, $P < 0.01$, *C. chinensis*; $F = 442.31$, $P < 0.01$, *C. maculatus*). The foods also affected developmental time of *D. basalis* among the sexes, the female took longer to develop ($F = 485.11$, $P < 0.01$, *C. chinensis*; $F = 330.72$, $P < 0.01$, *C. maculatus*) (Table 1). The results revealed that food plays a vital role in the development of male and female sex of *D. basalis* ($F = 5.27$, $P < 0.01$, *C. chinensis*; $F = 5.81$, $P < 0.01$, *C. maculatus*). Among the foods, honey was found to be the most effective enhancing the growth of *D. basalis* in both the hosts, and agar was less effective compared to control (Table 1).

D. basalis took longer time to develop on hosts which were not provided with supplemental food. The developmental time of either male was considerably lower in honey (10.41 ± 0.04 and 11.16 ± 0.07 in *C. chinensis* and *C. maculatus*, respectively) and sugarcane (10.55 ± 0.06 and 11.51 ± 0.08 days, in *C. chinensis* and *C. maculatus*, respectively). Whereas, developmental time for female was found to reduce in four foods, namely, honey, sugarcane, egg yolk and yeast (Table 1). So, it is revealed that female *D. basalis* are more dependent on food supplements than males.

The average developmental time was not significantly different from the control when *D.*

Table 1. Effect of different foods on developmental time of *D. basalis* parasitizing *C. chinensis* and *C. maculatus*

Food	Development time (Days)			
	C. chinensis		*C. maculatus*	
	Male (Mean ± SE)	Female (Mean ± SE)	Male (Mean ± SE)	Female (Mean ± SE)
Control	11.98 ± 0.06a	12.93 ± 0.08a	13.88 ± 0.03a	14.81 ± 0.05a
Honey	10.41 ± 0.04c	11.04 ± 0.08c	11.16 ± 0.07c	12.09 ± 0.09c
Sugarcane	10.55 ± 0.06bc	11.08 ± 0.05bc	11.51 ± 0.08bc	12.16 ± 0.07c
Egg yolk	10.72 ± 0.08b	11.39 ± 0.09b	12.04 ± 0.05b	12.69 ± 0.06bc
Yeast	10.88 ± 0.07ab	11.75 ± 0.06ab	11.82 ± 0.05b	12.24 ± 0.04c
Agar	11.10 ± 0.03a	12.07 ± 0.05a	12.46 ± 0.04a	12.98 ± 0.05b

In each column, means followed by different letters are significantly different according to DMRT ($P < 0.05$).

basalis was reared on yeast or agar supplement. This indicates that the parasitoids did not obtain nutritional benefits from yeast or agar during the development.

Carpenter and Greany (1998) reported that diet-reared wasp, *Diapetimorpha introita* (Cresson) took longer to develop and had greater have mortality than host-reared wasps. Addition of commercial nutrients to culture media and conditioned by supplementing the diet with lipid extracts from the host pupae, enhanced growth and development in *D. introita* (Ferkovich *et al.*, 1999; Carpenter *et al.*, 2001).

However, the expected developmental duration of this wasp may increase with the decrease of temperature and humidity.

Development of the male usually is faster than the female parasitoids in supplemented foods (Carpenter and Greany, 1998; Carpenter *et al.*, 2001). Composition of the food supplements provided to the parasitoids is an important factor (Pair, 1995), and developmental time could be shortened with the addition of adequate constituent of supplemental foods, like honey and sugarcane. Sugar-enriched food supplements enhance development greatly than protein and lipid enriched foods. In the present study, honey and sugarcane decreased the developmental time of *D. basalis* reared on *C. chinensis* and *C. maculatus*. Generally, the developmental time of *D. basalis* on *C. chinensis* is shorter than on *C. maculatus* when provided same food supplements. However, Carpenter *et al.* (2001) observed that lipid extract from *D. introita* not only enhanced the average weight of the male and females but also reduced their developmental time.

The potentiality of *D. basalis* as a biological control agent may result from augmentative releases against low-density populations of *C. chinensis* and *C. maculatus* in overwintering habitats. The advantage of short developmental time using food supplements on ectoparasitoids like *D. basalis*, is potential for their mass rearing. In area-wide management of certain insect pests, larval-pupal parasitoids like *D. basalis* might be useful in reducing pest populations within short time before they reach economic thresholds.

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