BIOCHEMICAL COMPARISON OF FIELD AND LABORATORY POPULATIONS OF *PODISUS MACULIVENTRIS* (HETEROPTERA:PENTATOMIDAE) IN FORIDA[1]

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Podisus maculiventris (Say) (Heteroptera: Pentatomidae) is an important generalist predator commonly found in grape vineyards and natural vegetation in north Florida. Beginning in May 2002, *P. maculiventris* were collected from the field using nine clear covered pheromone traps placed in a muscadine grape vineyard at the Florida A&M University Center for Viticulture in Tallahassee, Florida. Samples were collected daily except the week-ends. The traps contained a pheromone mixture (Aldrich 1988), and a vial of water with a cotton wick. Individuals of similar age (20 males and 20 females) were randomly collected and weighed from a laboratory colony fed *Tenebrio molitor* L. (Coleoptera: Tenebrionidae).

In preparation for biochemical analysis, insects were homogenized on ice using a Polytron homogenizer (Brinkman). Protein was determined using the bicinchoninic acid (BCA) assay (Pierce) with bovine serum albumen standards. Values were interpolated from the standard curve, and resulting values (μg/μl) were converted to μg/insect. To determine yolk protein content by ELISA, absorbances were compared in an indirect antigen ELISA to standard homogenates of eggs from *P. maculiventris* (Shapiro and Ferkovich 2002). Aqueous extracts of whole insects were subjected to lipid extraction with chloroform and methanol (Bligh and Dyer 1959). One milliliter of whole extract was mixed with NaCl and methanol/chloroform, vortexed and micro-centrifuged. The subnatant was removed, chloroform added and the process repeated. Fatty acids were transmethylated prior to gas chromatography. Hexane and methanolic boron trifluoride solution were added, and tubes were capped and heated. After cooling, hexane and H_2O were added, vortexed, and the upper hexane phase was removed. This was repeated, and combined hexane fractions were dried under N_2. Samples were analyzed on an Agilent 6890 GC.

Females from the laboratory colony (85.0 mg) were significantly heavier than males (57.0 mg) (t-test, $P < 0.05$). Average body weight of a field-collected female (56.0 mg) was also heavier than that of the male (43.0 mg). Laboratory-reared females were significantly heavier than field-collected females. Comparisons of live body weights of *P. maculiventris* collected in this study were made with body weights of laboratory-reared females under different feeding regimens (Legaspi et al. 1996). Results indicated that the field-collected females had maximal live body weights comparable to females fed one prey item every 9 days in the laboratory (Fig. 1). These findings are similar to those obtained by Legaspi et al. (1996) suggesting that *P. maculiventris* does not require high prey numbers to survive and possibly to reproduce under natural conditions.

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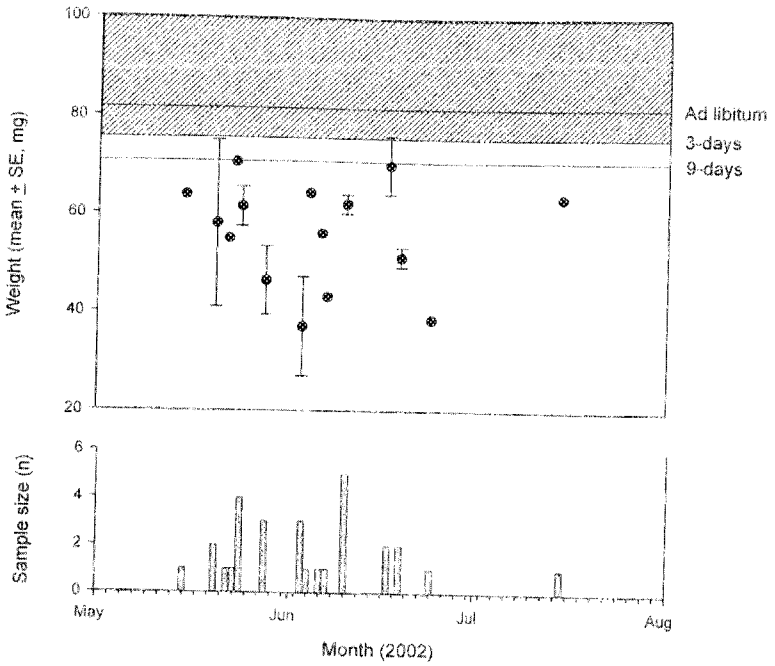

FIG 1. Live body weights of *Podisus maculiventris* (mean mg ± SE) collected by pheromone traps in Tallahassee, Florida, from May to July 2002 (histogram indicates sample size). The solid lines indicate the mean body weights of females provided prey ad libitum, or one prey item every 3 or 9 days in the laboratory. The shaded area denotes feeding rates corresponding to ad libitum and every 3 days (Legaspi et al. 1996).

To investigate general fitness and reproductive capacity in field vs. colony-reared females, contents of protein and fatty acids in females were analyzed. Total soluble protein was highest in female colony-reared insects (Table 1). This generally reflects the larger size of the colony-reared females, and more specifically their accumulation of nutrients and incorporation into developing eggs. Colony-reared females contained 37% more soluble protein (9.46 vs. 6.90 mg/insect) than field-collected females. Colony-reared females contained slightly more yolk protein than field-captured females ($t = 2.7$; $df = 10.7$; $P < 0.05$). Percentage contents of the methyl ester derivatives of the six most prevalent fatty acids were compared in colony-reared and field-collected females (Table 2). Four fatty acid methyl esters (FAME) derivatives significantly differed in percentage of total between colony-reared and field-collected insects. Percentages of the methyl esters of palmitic acid (16:0) and oleic acid (18:1) were significantly less in field-collected females than in laboratory-reared females, while those of stearic (18:0) and linolenic (18:3) acids were greater in field-collected females.

With the markedly higher levels of protein in colony-reared females, reduced reproductive capacity might be expected. Yolk protein determinations, however, indicate that field-collected females contained levels of yolk protein only slightly lower than those in colony-reared females (Table 1), suggesting that field-reared females are able to successfully reproduce despite low prey intake. Shapiro et al. (2000) demonstrated that yolk protein synthesis and appearance in hemolymph of *Podisus* follows feeding, and that the quality of

TABLE 1. Total Body Protein (± SE) in Female *Podisus maculiventris* (Field Versus Colony)

Insect	Soluble protein (mg/insect)	N	Yolk Protein (µg/insect)	N
Field	6.90 ± 0.52	23	84.90 ± 15.86	11
Colony	9.46 ± 0.95	9	98.82 ± 37.96	5

TABLE 2. Percentage Contents of the Methyl Ester Derivatives of the Six Most Prevalent Fatty Acids (FAME) in Colony-Reared Versus Field-Collected *Podisus maculiventris* Females

	Field		Colony	
FAME	Mean	SD	Mean	SD
16:0	20.74	7.47	31.17	2.65
16:1	4.68	3.44	4.66	4.01
18:0	10.44	2.45	6.22	2.33
18:1	30.57	6.46	42.29	4.77
18:2	17.07	6.87	13.31	3.03
18:3	16.50	6.19	2.35	0.73
Total	100.00		100.00	
	N=19		N=9	

diet affects the onset of appearance. Present results therefore indicate that field-collected females likely fed on prey sometime prior to collection. Further biochemical comparison between field and laboratory populations may provide a basis for estimating the impact of predators on populations of their prey, and conversely, the effect of prey on survival and reproductive fitness of predators.

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