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EFFECT OF NATURAL AND ARTIFICIAL DIETS ON THE LIFE HISTORY PARAMETERS OF MELON-FRUIT FLY, *BACTROCERA CUCURBITAE* (DIPTERA: TEPHRITIDAE)

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EXTENDED ABSTRACT

The tephrid fruit flies of the genus *Bactrocera,* with more than 500 species currently described as important pests of a number of fruit and vegetable crops. These fruit flies are among the most economically important pest species in the world (Kumar *et al.*, 2011; Bandara and Billa, 2015; Vargas *et al.*, 2015). Among the known melon-fruit flies, *Bactrocera cucurbitae* (Coquillett) is considered as the major threat to cucurbits resulting significant yield losses and quality losses inappropriate for local and export market. The magnitude of losses varies from species to species which may range from 30 to 100% depending on the cucurbit species and season (Dhillon *et al.*, 2005). Recommended methods of pre-harvest control programme for fruit and melon flies include; use of protein bait, male annihilation with pheromones, biological control, fruit bagging, early harvesting, and orchard sanitation. Application of Sterile Insect Technology (SIT) as a component of IPM is new to Sri Lanka but, implementation of such technology programme is important because it is considered as an ecologically safe procedure. Mass rearing of insects for sterilization and release requires protocols for the production of insects that are behaviourally and physiologically similar to those of the natural population.

Therefore, in this study, five larval diets (Thailand , Mauritius, Standard and Liquid and NPQS) were tested to determine the efficient medium for mass rearing of melon fruit fly (*Bactrocera cucurbitae*), as compared to four natural foods; Pumpkin, Bitter gourd, Snake gourd and Cucumber. Experiments were conducted at the Insectory, Horticultural Crop Research and Development Institute, Gannoruwa, Peradeniya from 2015 to 2016. During the study period, the average air temperature and Relative Humidity (RH) in the insectory ranged between 27-29 ^{0}C and 70-77%, respectively, and the photoperiod was maintained at Light: Dark - 9: 15 hours. *Bactrocera cucurbitae* eggs for the experiments were obtained from egg-laying devices kept in *B. cucurbitae* rearing cages in the insectory. *B. cucurbitae* eggs were inoculated on 250 g of natural diets and

50 g/dish artificial diets at the rate of 15 eggs/treatment. Mature larvae emerged from fruit were kept on sterilized sand (sterilized at 120 ^{0}C for 2 hours) for pupation. Pupae were sieved with a plastic mesh (18 meshes) and weighed. The experiment was replicated five times. The incubation period and hatching percentage of eggs and larval duration in each diet were recorded. The procedure adopted under natural diet and artificial diets were followed to determine the pupal weight, pupal duration and adult emergence and sex ratio. The emerging adult flies were fed with protein hydrolysate and a mixture of sugar and water (1:1 v/v) soaked in cotton. Using the standard procedures (Chang *et al.*, 2007) the following biological parameters of *B. cucurbitae* reared on diets were assessed; egg hatchability and incubation period, larval and pupal durations, pupal weight, percentage of pupal yield from larvae, percentage adult yield from pupae. All the percentage values check for normality and were log-transformed. The data of tested parameters were analyzed using ANOVA Statistical Analytical Software (SAS) Version 8.1.

Table1: Ingredients of the larval diets (for 1 litre) its $_{pH}$ value and Cost per litre.

Ingredient	Artificial Larval Diets				
	NPQS	Mauritius	Thailand	Standard	Liquid
Sugar (g)	50	82.8	120	162	121.8
Brewer's Yeast (g)	35	40	36	80	204
Wheat Bran (g)	175	351.4	260	242	-
Wheat Cerm Oil (ml)	-	-	-	-	2
C. HCl (ml)	1	8	2	-	-
M.P.H. Benzoate (g)	0.75	-	-	-	-
Sodium benzoate (g)	0.75	2	1	5	2
Tissue Paper (g)	25	-	-	-	-
Water (ml)	650	650	580	505	1000
Citric Acid (g)	-	-	-	6	23.1
Nipagen (g)	-	1	1	-	2
pH	4.5-4.9	5	5	4.8	3.5
Cost/ L (SLR)	1,621/	2,595/	1,854/	3,319/	8,436/

The life history parameters of *B. cucurbitae* larvae reared on artificiall diet and natural diets did not show significant differences except in larval and pupal durations. The tested natural and artificial diets except liquid diet found to provide favourable conditions for egg hatchability (range 61.3-90.5%). Incubation period was ranged between 3.6-5.4 days. The percentage pupal recovery in natural and artificial diets (except standard and liquid diets) tested ranged from 71-97% and was not significantly different to each other. The larval period in artificial diets was longer (7.8a) as compared to natural diets (4.8 b). High male to female ratio was observed on Thailand diet (2.5: 1) compared to other diets which recorded from 1.5 to 1 male: 1 female. We observed that

eggs did not hatch when incubated in liquid diet and larvae did not survive in standard diet, therefore these two diets considered as poor performers in *B. cucurbitae* rearing. The rest of the artificial diets performed similarly in terms of hatchability, incubation period, pupal recovery and pupal weight, pupal duration and adult emergence. High perish ability nature of natural diets can be used as initial stock for culturing *B. cucurbitae.* Therefore, NPQS diet, Mauritious diet and Thailand diet can be use for mass rearing as larval diets. But, Thailand diet is considered as the best in terms of the high male ratio. NPQS diet and Thailand diets are selected on the basis of the cost factor and high male ratio for the use of mass rearing of *B. cucurbitae* to introduce Sterile Insect Technology (SIT) program in Sri Lanka.

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