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EFFECTS OF THREE BENZYLOXY COMPOUNDS ON THE WEIGHT OF DIFFERENT DEVELOPMENTAL STAGES FOLLOWING LARVAL TREATMENT IN *CORCYRA CEPHALONICA* (STAINTON) (LEPIDOPTERA: PYRALIDAE)

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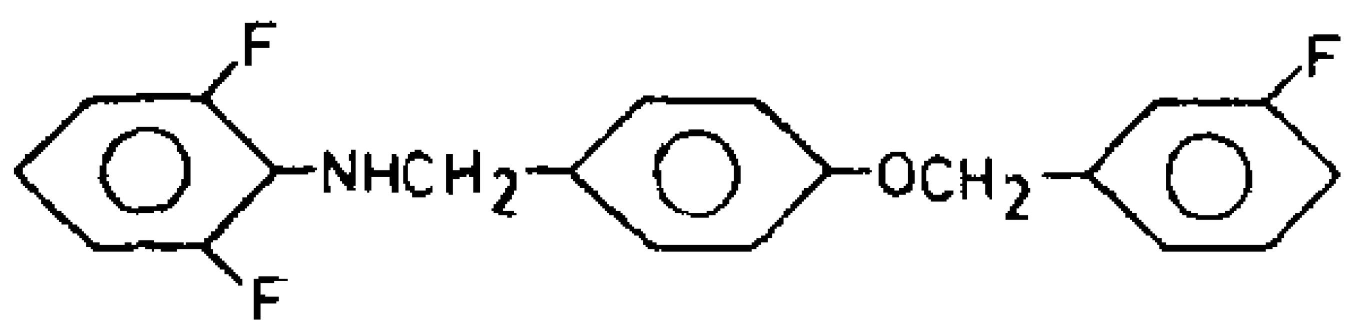
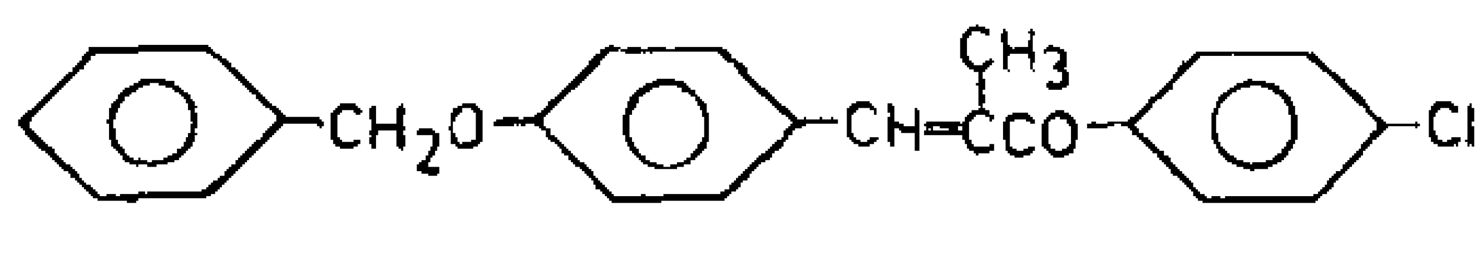
AFTER the discovery of some aromatic schiff bases and related compounds as insect juvenile hormone mimics, their merits were assessed by biological tests on *Oncopeltus fasciatus* and *Tenebrio molitor*[1]. A further exploration of three benzyloxy compounds AI3-63604, AI3-63629 and AI3-63701 on the growth and development of insects was therefore undertaken[2]. The present paper deals with changes in the body weight of different developmental stages after treatment on the last instar larvae of the rice moth, *Corcyra cephalonica* (Stainton) (Lepidoptera: Pyralidae), a major pest of stored commodities[3,4].

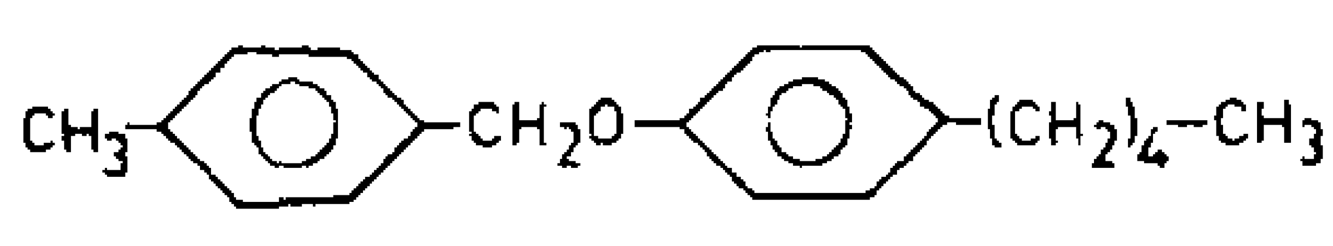
The three benzyloxy compounds (figure 1) were applied topically in acetone solution on active feeding stage of 0–24 hr old last larval instar at the rates of 100, 50, 10 and 1 μg per individual. Each individual received 1 μl solution containing the required amount of the compounds and 1 μl of pure acetone per individual served as control treatments. Both treated and control



I



II



III

Figure 1. Chemical structure of the three benzyloxy compounds: **I** AI3-63604, **II** AI3-63629, **III** AI3-63701

individuals were reared at 29 ± 1°C, 80–90% relative humidity and 14–10 hr light (semi-dark) dark cycle with powdered grains of sorghum [*Sorghum bicolor* (Linn.) Moench] as food. After treatment the larvae were released in jars containing food. All the control and most of the treated larvae passed through post-feeding state[5], and then pupal stage before attaining the adult stage. Sufficient number of such developmental stages, in the same age groups (0–24 hr), were collected and weighed randomly from all the treatments and controls. The nature of significance in the differences of mean values of the weight of different developmental stages in treated and control series was tested by analysis of variance technique.

The three benzyloxy compounds prolonged the larval life span 1–2, 1–3 and 5–8 times respectively. Of course, active feeding lasted for about half of the total larval life period. Moreover, the experimental larvae underwent 1, 1–3 and 2–4 extra moults after the application of three compounds respectively[6,7]. The giant supernumerary larvae, finally formed after increased food consumption, were bigger and heavier at the post-feeding state (table 1).

In AI3-63604 treatment, the larvae at post-feeding state differed in weight significantly from control ($F = 34.600$, $P < 0.001$; d.f. 4,45) and the dosage effects were non-significant ($P > 0.05$) in 50 μg and 10 μg treatments; 100 μg treatment, however, produced significantly different effects ($P < 0.01$). The weights in AI3-63629 and AI3-63701 treatments differed significantly from control values ($F = 231.349$, $P < 0.001$; d.f. 4,45 for AI3-63629 treatment and $F = 220.321$,

$P<0.001$; d.f. 4,45 for AI3-63701 treatment) and the dosage effects were also significantly different ($P<0.01$). Treatments of 1 μg of each compound had no significant effect ($P>0.05$).

Pupae, developed after larval treatments with AI3-63604, AI3-63629 and AI3-63701, were externally normal in appearance but of giant size with increased weight (table 1) which differed significantly from control value (F = 35.472, $P < 0.001$; d.f. 4,45 for AI3-63604 treatment; F = 166.160, $P < 0.001$; d.f. 4,45 for AI3-63629 treatment and F = 234.347, $P < 0.001$; d.f. 4,45 for AI3-63701 treatment) and the dosage effects were also significantly different ($P < 0.01$). 1 μg treatment, however, produced no significant effect ($P > 0.05$).

The resultant forms developed after larval treatments were larvoid adults and adultoids. These moths were heavier than the control moths (table 1). In the case of AI3-63604 and AI3-63629 treatments, body weight differed significantly from control (F = 9.617, $P < 0.001$; d.f. 4,45 and F = 12.268, $P < 0.001$; d.f. 4,45 for AI3-63604 and AI3-63629 treatments respectively) and there were dosage effect ($P < 0.01$). 10 μg and 1 μg treatments had no significant effect ($P > 0.05$). The increase in weight after AI3-63701 treatment was significantly different from control (F = 15.750, $P < 0.001$; d.f. 4,45), the dosage effects were also significantly different ($P < 0.01$); 1 μg treatment, did not show any significant effect ($P > 0.05$).

In the present investigation, induction of surplus larval development, accompanied by additional moult after the application of three benzyloxy compounds is similar to the results caused by terpenoid or sesquiterpenoid juvenile hormone analogues on *C. cephalonica*[8-11]. These benzyloxy compounds have also been designated as potent insect juvenile hormone mimics[2]. The juvenile hormone analogues interfere with the physiological programming of the secretory functions of the prothoracic glands[12]. Several authors[13-15] suggested that the delay of larval-pupal moult is due to inhibitory action of juvenoids on the brain. Further, it has been found that larval-pupal moult is not possible until the applied compound disappears from the body[16]. The last instar larvae of *Manduca sexta* initiate larval-pupal moult when they reach a critical size and the titer of their endogenous juvenile hormone drops[13]. This functional principle may be applicable for the present compounds too.

The results also demonstrate that benzyloxy compounds induce an enormous increase in appetite. Thus increased feeding may result large larvae at post-feeding state, pupae and adults with significant increase in weight. For juvenoid, at least one of the main functions has been the stimulation of utilization of food for growth through hypermetabolism[17,18]. Results similar to the present findings have also been observed after juvenoid treatments in the last instar larvae of some other lepidopteran insects[16,19-25].

Table 1 *Weights of larvae at post-feeding state (L), pupae (P) and adults (A) after treatments of three benzyloxy compounds on the last instar larvae of C. cephalonica. Range values are inside parentheses*

Doses (μg/ind.)	Weight (Mean ± S.E.) in mg		
	AI3-63604	AI3-63629	AI3-63701
L			
100	60.4 ± 5.55	100.90 ± 6.96	109.30 ± 8.74
	(50 – 69)	(89 – 110)	(94 – 121)
50	53.90 ± 3.36	80.20 ± 3.51	91.20 ± 7.13
	(49 – 59)	(73 – 86)	(81 – 104)
10	50.30 ± 3.63	69.70 ± 5.33	74.90 ± 4.48
	(43 – 57)	(63 – 78)	(66 – 80)
1	41.60 ± 2.72	46.90 ± 3.56	45.10 ± 3.47
	(38 – 47)	(40 – 52)	(39 – 50)
Control	43.70 ± 2.90	43.70 ± 2.90	43.70 ± 2.90
	(40 – 49)	(40 – 49)	(40 – 49)
C.D. at 1%	4.945	5.961	7.351
5%	3.702	4.463	5.503
P			
100	43.20 ± 3.60	63.90 ± 3.64	73.10 ± 3.31
	(38 – 50)	(58 – 70)	(69 – 81)
50	39.70 ± 2.19	48.80 ± 3.28	56.30 ± 3.84
	(35 – 43)	(44 – 56)	(51 – 61)
10	34.80 ± 2.95	36.20 ± 3.62	47.60 ± 3.69
	(30 – 40)	(30 – 43)	(41 – 53)
1	30.80 ± 2.63	32.40 ± 3.00	32.70 ± 2.41
	(27 – 34)	(28 – 38)	(29 – 36)
Control	30.00 ± 2.75	30.00 ± 2.75	30.00 ± 2.75
	(26 – 35)	(26 – 35)	(26 – 35)
C.D. at 1%	3.635	4.161	5.105
5%	2.721	3.115	3.821
A			
100	33.40 ± 2.61	37.90 ± 6.52	43.00 ± 6.79
	(30 – 37)	(30 – 51)	(34 – 55)
50	30.50 ± 2.37	32.70 ± 2.14	37.80 ± 3.57
	(25 – 35)	(30 – 36)	(32 – 45)
10	28.50 ± 1.91	30.10 ± 2.34	33.50 ± 6.71
	(24 – 30)	(25 – 34)	(26 – 45)
1	26.30 ± 3.34	27.40 ± 3.47	28.60 ± 3.23
	(20 – 30)	(20 – 31)	(22 – 33)
Control	26.50 ± 3.72	26.50 ± 3.72	26.50 ± 3.72
	(20 – 31)	(20 – 31)	(20 – 31)
C.D. at 1%	3.650	4.994	6.452
5%	2.733	3.739	4.830

C.D. = Critical difference.

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THE PRIMARY ORB WEB OF *ULOBORUS FEROKUS* BRADOO (ARANEAE: ULOBORIDAE)

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THE occurrence of primary orb web has been reported[1-4] in a few spider species of the family Uloboridae. It is exclusively made by the second stage spiderlings after they emerge from the cocoon and not by the first instar[1] as reported by Szlep[3], who overlooked the fact that the first (pre-eclosion) moult is completed within the cocoon. The present note gives some new and interesting features on the primary orbs of *Uloborus ferokus* living as a commensal on the web sheets of the social spider *Stegodyphus sarasinorum*[5,6].

The primary orbs differ markedly from the typical orbs in several features and they represent the first kind of orb web found in the life history of uloborid spiders. Nothing equivalent to primary orb of Uloboridae seems to be present in the orb weavers of the family Araneidae. After emergence from the cocoon, the second instar spiderlings of *U. ferokus* show a geonegative behaviour and explore the host web. They leave fine drag lines and spin horizontal primary orbs daily, early in the morning. But these tiny orbs get quickly damaged due to wind, rain or by prey capture activities, so that these orbs are not observed later in the day. Nor do they make successive orbs on the same day. The commensal spiderlings thus spend the rest of the day on the host web (figure 1) from which they procure their nourishment in the form of minute prey.[5]

The primary orb is about 1 cm in diameter. It consists of frame threads that are fixed on the host web, a central hub, primary radii, a permanent spiral thread, secondary radii and 3 to 5 stabilimenta. The