

1.9) INSTRUCTOR’S GUIDE TO FEED CONVERSION IN MEALWORMS

Overview: The results below are based on a trial involving 56 worms over a period of 10 days during which about 9% died. The survivors were weighed, euthanized, and dehydrated in order to obtain the conversion ratio of 0.338:

Worms	Fresh (g)	Conversion ratio	Dried (g)
1) Final mass living	6.5	× 0.338	2.2
2) Mass of dead and molted portions	N/A	N/A	0.3
3) Final total dry mass: Dried column (1) + (2)	N/A	N/A	2.5
4) Initial mass	5.2	× 0.338	1.76
5) Fresh mass gained: Fresh column (1) – (4)	1.3	N/A	N/A
6) Dry mass gained: Dried column (3) – (4)	N/A	N/A	0.7

Cat food	Fresh (g)	Conversion ratio	Dried (g)
7) Mass fed	10.4	× 0.921	9.57
8) Mass leftover	N/A	N/A	6.9
9) Dry mass eaten: Dried column (7) – (8)	N/A	N/A	2.7

Apple	Fresh (g)	Conversion ratio	Dried (g)
10) Mass fed	90.2	× 0.149	13.4
11) Mass leftover	N/A	N/A	12.9
12) Dry mass eaten: Dried column (10) – (11)	N/A	N/A	0.5

Dry mass consumed: 2.7g + 0.5g = 3.2g

FCR for dry worm biomass = 3.2g ÷ 0.7g = 4.6 ≈ 5

Efficiency for dry worm biomass = (1 / 4.6) × 100% ≈ 20%

FCR for fresh worm biomass = 3.2g ÷ 1.3g = 2.5

Answers to Questions: 1) Answers will vary but a typical outcome is 10%. 2) Adults may gain some mass, but they do not grow in size, so the FCR would be much higher. 3) The FCR would be higher because grains have a lower protein content. 4) The efficiency is higher because the animals are being evaluated during the portion of their life cycle when the growth rate is maximized. 5) heat, movement, metabolism, reproduction, metamorphosis, etc. 6) a) This closely resembles the FCR of chicken, fish, and crickets. b) FCR can be adversely affected by overfeeding and low quality feed.

Logistics: If students cannot do this in class, one option is for them to do it at home. In this scenario you will need to develop a strategy for them to pre-weigh several days rations of feed at school (assuming they cannot take home the electronic balances to weigh at home). Pre-weighed apple slices can keep for days if they are refrigerated and tightly wrapped to minimize exposure to oxygen.

Degree of Difficulty: 2—This lab is easy to set-up, but students need to be reliable and meticulous about recovering and storing all leftover food, molted exoskeletons, and dead worms.

Materials: 50-100 small meal worms (average mass 0.1 grams or less); plastic container for raising worms; semi-moist cat food, apple slices; paper towels; three sealable plastic bags (sandwich size); a pair of forceps; evaporating dishes; a balance that can weigh to nearest 0.1 g; and a drying oven.