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White Worms Enchytraeus albidus as a Live Feed and Formulated Aquafeeds

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ABSTRACT

White worms are composters and feed on decaying plant- and animal-based organic matter under natural conditions. Thus, these worms can be cultured on a variety of feeds considered wastes, including the byproducts of brewery, bakery and other food processing industries, as well as proteolyzed yeasts prepared in paper and pulp plants. This dietary flexibility provides the culturist with the potential to develop mutually beneficial local partnerships and generate favorable publicity. white worms were high in protein (49-69%) and lipids (10-27%) and low in ash (5-8%), indicating that they would meet the dietary needs of species requiring a high protein, relatively high lipid, low ash diet. Compared to fatty acid profiles reported for standard live feeds like rotifers, Artemia, and copepods, white worms provided less n-3 long-chain polyunsaturated fatty acid content (DHA 0-0.5%, EPA 2-18%, total LC-PUFAs 4-25%), with the highest levels in worms fed mixed produce or sugar kelp. White worms exhibit many attractive characteristics as feeds, but commercialization will require improved culture techniques to produce greater worm biomass while reducing production costs. Depending on the target species, white worms may need enrichment to increase n-3 LC-PUFA levels.

INTRODUCTION

White worms show great promise as a feed (either live, frozen, or an ingredient in processed feeds) for a diverse set of cultured organisms during some period of their development, including freshwater and marine fishes (including ornamentals) as well as some crustaceans, amphibians, reptiles, and birds. White worms are robust, found worldwide (Ghabbour 1966), and grow in terrestrial systems to 2-4 cm in length (Ivleva 1973). White worms are euryhaline and will survive in both fresh and full strength seawater (Ivleva 1973), wriggle and attract predators (Walsh 2012), and do not noticeably impair water quality when added to aquaculture systems (Walsh 2012), making them ideal live feeds for cultured aquatic species. In addition, they are retained longer in aquaculture systems since they are bottom-dwelling and are not easily flushed from rearing tanks like other traditional live feeds (e.g., Artemia; Walsh 2012). White worms also are easy and inexpensive to rear on a small scale (Walsh 2012).

WHITEWORMS IMPORTANCE

Marine invertebrates can provide a valuable substitute or supplementary nutritional source that may decrease the demand for fishmeal in the production of aquafeeds. Large-scale production of live aquatic worms and other invertebrates also may be useful for marine or estuarine stock enhancement and sea ranching efforts, as well as for aquarium, terrarium, laboratory and hobby maintenance of fishes, amphibians, reptiles, birds and larger invertebrates. Ideally a mass cultured invertebrate is fast-growing, precocious, fecund, easy to rear and able to thrive at high densities (Ivelva 1973). White worms *Enchytraeus albidus* are 2–4 cm long, globally distributed, intertidal oligochaetes that feed on decaying organic matter. They are found on a wide variety of moist terrestrial soils, in fresh and brackish waters, in the marine littoral zone and on aquatic plants washed ashore. They have even been found in large densities within the gravel filters of irrigated fields as well as in urban water pipes (Ivelva 1973). Using low- or no-cost byproducts as feed inputs in aquaculture is attractive in terms of reducing feed costs and environmental footprints for aquaculture operations, as well as helping to address the challenges other industries face regarding byproduct disposal. The indiscriminate feeding behavior white worms exhibit is one of the main advantages of worm production. Many industries generate waste or byproducts that white worms will eat, however, we do not know which of these resource streams are optimal for worm growth, production, and nutritional profile.

CULTURE OF WHITEWORM

Worms were reared in clear plastic shoeboxes (34.5 x 20.25 x 12.75 cm) filled 5-7 cm high with damp organic potting soil (Walsh 2012). Feeding and moistening of the soils of all cultures (up to 25). Feed, such as stale formulated fish pellets, baby cereal flakes, hot dog rolls, a mixture of moistened dry dog food with oil, was distributed against the bottom of containers and covered with soil to minimize infestation by mites or small flying insects. Feed levels could be monitored simply by viewing the underside of the clear container and replenishing feed when necessary. Worms were easily harvested by placing the rearing container on a heat source, such as a heating pad.

CONCLUSION

White worms have a high protein (75 percent) and lipid (15 percent) content with relatively low levels of ash 6 percent. White worms are good source of n-3 long chain polyunsaturated fatty acids, though the DHA content may be limiting worms provide a balanced supply of

EAA including tyrosine, tryptophan, arginine, histidine, cystine and methionine, as well as calcium, phosphorus, iron, carotene and vitamins A and B2 (Ivelva 1973). They are readily accepted for direct consumption by juvenile sturgeon (Ivelva 1973) and winter flounder (Klein- Mac Walsh 2012), indicating that, as a feed, white worms provide adequate palatability, amino acid balance, energy and digestibility, all requirements of an appropriate protein source for aquafeeds.

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