# Application of maggot in ornamental fish culture

**I Wayan Subamia, Yogi Himawan**

Center of Research and Development of Ornamental Fish Aquaculture. Jl. Perikanan 13, Pancoran Mas, Depok. Email: yogihimawan@yahoo.com

**Abstact.** Maggot is one of alternative food source that potential to develop. At present, technique 0f culture of maggot can be done especially using media of Palm Kernel Meal (PKM). Application of maggot conducted in form of live food, freeze, and meal Application of maggot have been done for several commodity of ornamental fish especially in Center of Research and Development of Ornamental Fish Aquaculture. Research using aquarium in indoor and conicle tank at outdoor.. Aplication maggot to the ornamental fish such as Gurame padang (*Osphronemus gouramy*), Rainbow Kurumoi (*Melanotaenia parva*), Botia (*Chromobotia macracanthus*), and Red cherry shrimp (*Neocaridina heteropoda*) results average of final weight and total length respectively 241,27 g and 18,26 cm ; 15,23 g and 24,06 cm ; 1,8 g and 4,9 cm ; 0,035 g and 0,03 cm. Meanwhile, survival rate of all ornamental fish in that research achieve 100%. Water quality parameter in that research still in good condition. Base on results of research, maggot give the positive effect to the growth and survival rate off all ornamental fish that tested
**Keywodrs**: Maggot, ornamental fish, growth, survival rate

## Introduction

Several studies have used maggot as ornamental fish feed in the form of life, but has never been tested on rainbow fish Kurumoi. In research Rachmawati (2010) note that the nutritional value of maggot age of 10 to 25 days with media coconut oil contains 42-46% crude protein and crude fat 15-28%. The nutritional value indicates that Maggot potential and can be used as an alternative protein sources as fish feed in the form of life. As we know that protein is the main source of nutrients required in both the quality and quantity of feed, protein plays a role in the formation of the material for the growth of living things, and is also important for the production of enzymes and other materials (Steffens, 1989). In dynamic conditions, proteins are continuously synthesized and degraded so that the food supply is needed for life to form amino acids and non-specific nitrogen for body maintenance and growth (Robinson & Li, 2007). Fish for protein needs depend on the type of fish, size of fish, feed ingredients, quality protein, and the environment (NRC, 1983).

Maggot is one alternative feed for fish seed. Feed it been tested on the type of catfish *Ictalurus punctatus*. In the catfish fingerling size, Maggot can replace high-quality fish meal (Shepard & Newton, 1999). Maggot or larvae of black soldier fly has a stout body, a little flat and very small (1.8 mm), the color yellow and black head, his skin rough and hard, about 1.8 mm long when newly hatched. The larvae mature length of about 18 mm and a width of 6 mm, although some individuals reaching 27 mm long. Maggot abundant in decaying organic matter and plant debris or garbage (Dress & Jackman, 1999). Recent research on channel catfish *Ictalurus punctatus* fingerlings size indicates that the maggot could replace fish meal of high quality and provide the same growth, although given the conditions cut (Shepard & Newton, 1999). Maggot utilization studies on some ornamental fish and shrimp have been conducted at the Research Institute and the development of Ornamental Fish Aquaculture, Depok in West Java, including fish Gurame field (Osphronemus gouramy), Rainbow Kurumoi (*Melanotaenia Parva*), and Red cherry shrimp (*Neocaridina heteropoda*).

## Material and Methods

The data obtained is the result of research conducted at the Center for Research and Development of Ornamental Fish Aquaculture, Depok. Maggot application research mainly done on commodity Gurame Padang (*Osphronemus gouramy*), Rainbow Kurumoi (*Melanotaenia Parva*), and Red cherry shrimp (*Neocaridina heteropoda*). Observations included measurable parameters such as the growth of weight, length growth, survival, and quality of water

## Results and Discussion

### Growth

The results showed that the growth of the gurame padang fed maggot fish silage was relatively higher than usual Maggot administration (Figure 1). After maintenance for 4 months, giving ordinary maggot yielded an average absolute growth of 241.27 g, standard

length and total respectively reached 18.26 cm and 24.06. Giving Maggot fish silage yield an average absolute growth of 284.46 g standard and total length of 19.26 cm and 24.96 cm. However, despite the growth in the provision of maggot treatment of fish silage is relatively high, but the statistical analysis showed no significant different between treatments (p> 0.05).

From the chart above, the growth rate of the gurame padang, Rainbow Kurumoi, and Red cherry shrimp fed using maggot fish silage appear higher results in final growth than usual delivery Maggot. This is presumably because the nutritional value of fish silage Maggot better than usual, especially on the content of omega 3 and 6 (Table 1). The results of the analysis in Table 1 shows that the nutritional value of CRP and maggot after administration of fish silage has increased especially in the acid content of omega 3 and 6. In addition to the acid content of omega 3 and 6, which increased after adding fish silage, Maggot own nutritional value is high enough for feeding carp fields (Table 2).

In addition to the feed, fish and shrimp adapt themselves to feed the prairie Maggot high enough or it could be said preference level (palatability) the maggot is quite high. In the face of changing environmental conditions in which an organism faced with a limited choice, make physiological adaptability necessary to maintain or achieve optimal life skills. Factors supporting the growth of gurame padang in this research is also suspected because there is a character at a young carp tend carnivores, but after adults tend herbivore. According to Susanto (2002), the gouramy species at relatively young adults classified as carnivores and herbivores.

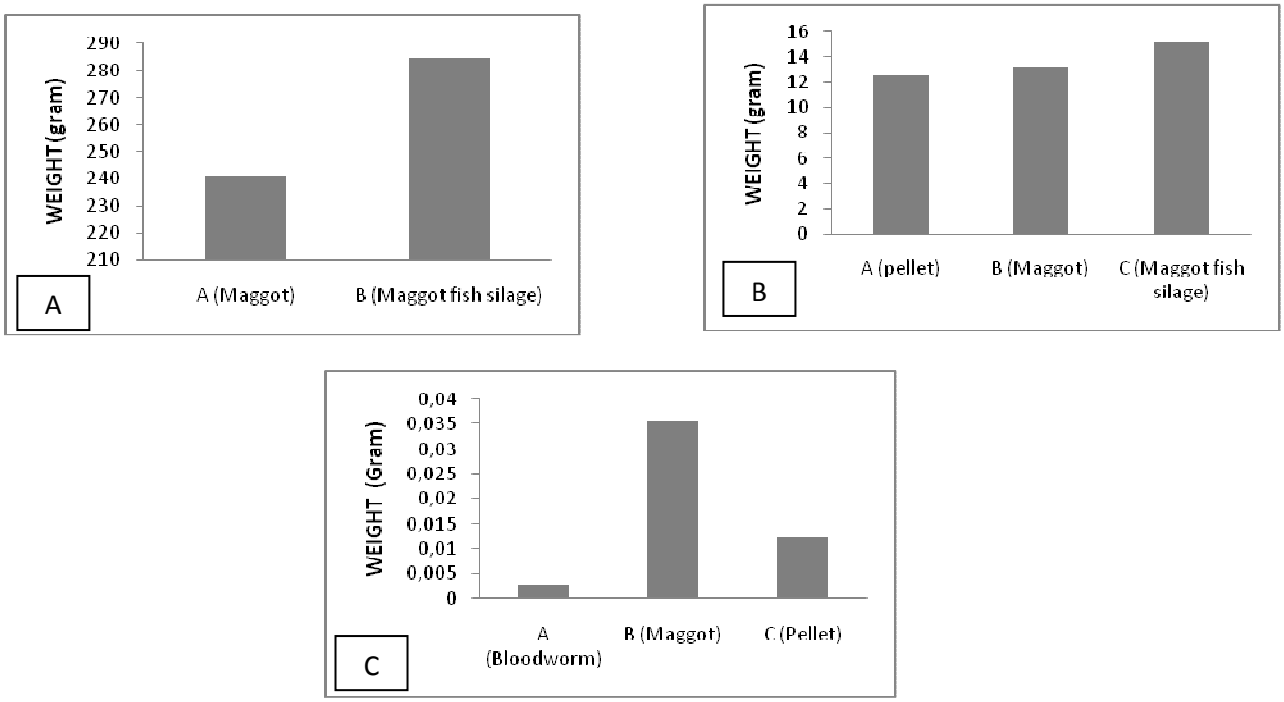


Figure 1. Average of final growth of gurame padang (*Osphronemus gouramy*) (A), Rainbow Kurumoi (*Melanotaenia parva*) (B), Red cherry shrimp (*Neocaridina heteropoda*) (C) by providing regular maggot and maggot fish silage

Table 1. Analysis of nutrition and Maggot PKM before and after fish silage

| Parameter | PKM (%) | Mag (%) | PKM silage (%) | Mag Silage (%) |
|---|---|---|---|---|
| Σ Saturated FA | 63,59 | 43,78 | 44,45 | 31,57 |
| Σ monounsaturated | 10,01 | 19,27 | 15,78 | 18,19 |
| Σ n-6 | 0,02 | 0,05 | 2,47 | 1,73 |
| Σ n-3 | - | 0,13 | 12,67 | 6,77 |
| Σ Others Polyunsaturated | 1,90 | 4,09 | 5,31 | 6,92 |

Based on the results of the proximate analysis, protein content of about 44% maggot as a source of high protein fish feed. According Khairun and Sudenda (2002) protein requirements for growth of fish ranged from 25-30% at least. In addition, the proteins that contained allegedly Maggot is still in the acceptable threshold carp paddock, because according Effendie (1997) high content of protein that exceed the threshold and tolerance of the fish will help slow the growth of the fish and make them prone to stress. Maggot nutritionally complete relative allegedly one of the factors driving the growth of carp. The presence of feed maggot treatment is used to determine the best approach variability results suggest that small fish such as rainbow fish seed kurumoi require higher protein levels than larger fish because of metabolism and growth rate were also higher (Stickney and Lovell , 1977). Statements Robinson and Li (2007) on a number of factors affecting protein feed requirements such as fish size, water temperature, feeding, protein quality, availability of natural feed, and feed management practices contributed to the consideration in this study. The main approach in this study because Maggot Maggot nutrients used for growth and maintenance of the body so naturally all of the energy used by a protein derived from fish (Hepher & Pruginin, 1981). Although the protein in the feed can be obtained from various sources, but will vary the quantity as well as quality. Measurable quantity of protein nitrogen values generated by proximate analysis measurements while the protein quality is generally measured in terms of amino acid profile contains.

Table 2. Proximate analysis Maggot (Source : IRD,2004)

| Proximate (%) | | Asam Amino (%) | | Asam Lemak (%) | | Mineral (%) | |
|---|---|---|---|---|---|---|---|
| Kadar air | 2.3801 | Serin | 6.353 | Linoleat | 0.697 | Mn | 0,0486 mg/g |
| Protein | 44.258 | Glisin | 3.8 | Linolenat | 2.239 | Zn | 0.0924 |
| Lemak | 29.65 | Histidin | 3.367 | Saturated | 20,0002mg/g | Fe | 0.68 |
| | | Arginin | 12.953 | Monomes | 8.709 | Cu | 0.01 |
| | | Treunin | 3.166 | | | P | 0.1317 |
| | | Alanin | 25.684 | | | Ca | 55.65 |
| | | Prolin | 16.937 | | | Mg | 3.5 |
| | | Tyrosin | 4.155 | | | Na | 13.71 |
| | | Valin | 3.874 | | | K | 10 |
| | | Sistin | 2.047 | | | | |
| | | Iso Leusin | 5.415 | | | | |
| | | Leusin | 4.756 | | | | |
| | | Lisin | 10.652 | | | | |
| | | Taurin | 17.53 | | | | |
| | | Cystein | 2.047 | | | | |
| | | NH3 | 4.326 | | | | |
| | | Orn | 0.513 | | | | |

In this case, maggot as food resources were able to be utilized and converted shrimp well for growth. Maggots are used is in the form of life the age of 10 days, but before the given cut first to make it easier to consume shrimp. High of adequate protein content in Maggot allegedly influenced the growth of Red cherry shrimp tested. High protein content can

improve the growth of fish and shrimp (Suryanti *et al*, 1997). Maggot This is because the size is too large when eaten whole. However, although it has been cut usually Maggot will keep moving in the water so fishing shrimp to eat. The nature of the feed actively moving but not so easy to eat fish and shrimp (Wahyuningsih and Priyambodo, 2005).

**Survival rate**

In addition to growth, the other parameters were observed survival rate of carp meadow, rainbow Kurumoi, and red cherry during the maintenance period. Based on these results, obtained in the survival rate of each treatment by 100% (Figure 2). Survival rate showed that the effect of regular and Maggot Maggot fish silage did not affect the survival rate of each fish and shrimp tested.

The high survival rate of carp, Rainbow Kurumoi and Red cherry shrimp presumably because the fish and shrimp are able to digest and absorb nutrients so that the positive effect of maggot to survival rate. In addition to the ability to digest, allegedly because of the requirement for the survival and feed maggot does not lower the maintenance of a suitable environment so stressful conditions during maintenance can be avoided. It is appropriate that proposed by Effendie (1979) that survival is determined by the availability of food and water quality. In addition to the adaptation, survival is also influenced by the suitability of feed given as treatments that can utilize the nutrients to grow and maintain survival rate. The most appropriate feed is easily digestible feed, which can be adjusted in size to the size of the fish's mouth opening, and contains protein that supports growth (Djarijah, 1995).

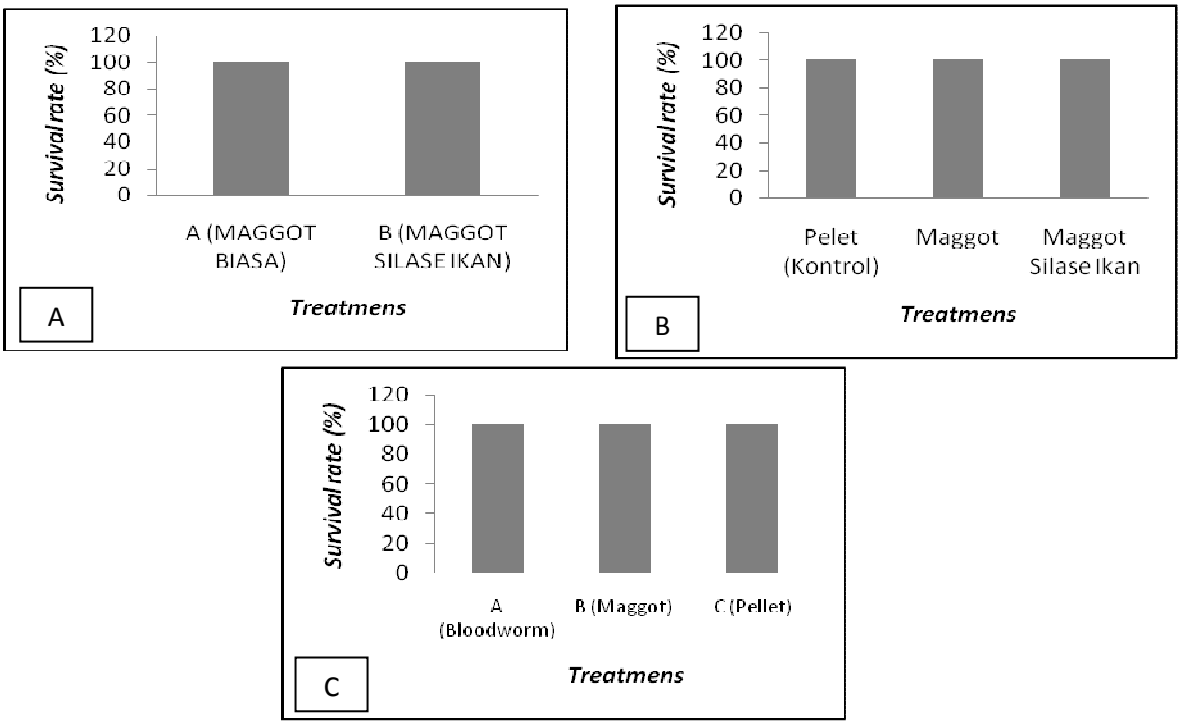


Figure 2. Average of survival rate of gurame padang (*Osphronemus gouramy*) (A), Rainbow Kurumoi (*Melanotaenia parva*) (B), and Red cherry shrimp (*Neocaridina heteropoda*) (C) by providing regular maggot and maggot fish silage

In addition because of the level of preference, the relatively high survival was also suspected because of essential amino acids in the fish enough so that it does not result in a decrease in appetite or food intake reduction. Fat in the diet is an important source of energy and essential fatty acids play a role in normal growth and survival of fish. Although the fish has a low energy requirement giving excess fat causes the fish susceptible to substitute it (Earle, 1995). The presence of unsaturated fatty acids and omega-6 and omega-3 fatty acids such as linoleic acid, linolenic acid, and the acid eicosapentanoik docosaheksanoik is needed especially in the freshwater fish (NRC, 1993).

## Conclusions

Giving Maggot in the fields of carp, rainbow kurumoi, and cherry red shrimp produce final growth highest average, a row of 284.46 g, 15.23 g, 0.0356 g. Application Maggot during field maintenance carp, rainbow kurumoi, and cherry red shrimp yield of 100% survival. The addition of fish silage on the PKM (Palm Kernel Meal) or coconut oil as a medium Maggot maintenance can increase the content of omega 3 and 6. Water quality parameters during the maintenance period is still in the normal range.

## References

Departemen Pertanian, 1992. Petunjuk teknis budidaya pakan alami. *Dalam*: Makalah Badan Penelitian dan Pengembangan Departemen Pertanian, Jakarta.

Djarijah, A. S. 1995. Pakan ikan alami. Penerbit Kanisius, Yogyakarta: 87 hlm.

Dress, B. M dan J. Jackman. 1999. Field guild to Texas insects. Gulf Publishing Company,Texas

Earle, K.E.,1995.The nutritional requirements of ornamental fish. *Vet.Q.17* (Suppl.1): S53–S55.

Effendie, M. I. 1979. Metode Biologi Perikanan. Yayasan Dwi Sri. Bogor.

Effendie, M. I.1997. Pengantar Aquakultur.Penebar Swadaya. Jakarta.

Handayani, S. 2006. Pengaruh penggunaan tepung kepala udang windu pada pakan buatan terhadap pertumbuhan dan kelangsungan hidup benih lobster air tawar (*Cherax albertis*). Skripsi. Jurusan Biologi FMIPA – Universitas Negeri Jakarta. Tidak dipublikasikan.

Hem, S., S. Toure., C. Sagbla, & M. Legendre. 2008. Bioconversion of palm kernel meal for aquaculture: Experiences from the forest region (Republic of Guinea). African Journal of Biotechnology, 7(8): 1192-1198.

Hepher, W. & Y. Pruginin. 1981. Commercial Fish Farming with Special Reference to Fish Culture in Israel. John Willey and Sons. New York. ix+261 pp.

Khairuman, A dan D. Suhenda. 2002. Pembenihan dan Pembesaran Ikan Gurami Secara Intensif. Agromedia Pustaka. Jakarta.

Lovell, T. 1989. Nutrition and feeding of fish. Van Nostrand reinhold, New York: xi+260 p.

NRC (National Research Council). 1983. Nutrient Requirements of Warm Water Fishes and Shell Fshes. National Academy Press, Washington, DC., USA reviseded, 274 p.

NRC (National Research Council). 1993. Nutrient Requirements of Fish. National Academy Press, Washington, DC, USA, 114 p.

Rachmawati. 2010. Sejarah Kehidupan Hermetia illucens (Linnaeus) (Diptera: Stratiomydae) pada Bungkil Kelapa Sawit. Tesis Sekolah Pasca Sarjana, Institut Pertanian Bogor. Tidak dipublikasikan. 74 hal.

Robinson, E.H., & M.H.Li. 2007. Catfish protein nutrition: revised. Bulletin 1159, April 2007: 22 p.

Shepard, C. dan L. Newton. 1999. Black soldier fly may produce nutritious feedstuff. Feedstuffs. 71 (50) : 21-29.

Steffens, W. 1989. Principles of fish nutrition. Ellis Horwood Limited Publishers. Halsted Press: a division of John Willey & Sons. England, 384 p.

Stickney, R.R., & T. Lovell. 1977. Nutrition and feeding of Channel catfish. Southern Cooperative Series. Bulletin 218, 67 pp.

Suryanti, Y., A. Priyadi & N. Suhenda. 1997. Pemberian pakan buatan untuk ikan gabus (*Chana striatus*) dalam keramba di Kalimantan Timur. Jurnal Penelitian Perikanan Indonesia. 3(3): 35-40.

Wahyuningsih, T. & Priyambodo. 2005. Budidaya pakan alami untuk ikan. Cetakan VI. Penebar Swadaya. Jakarta.