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Effect of feeding with different types of nutrients on intensive culture of the water flea, *Daphnia magna* Straus, 1820

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ABSTRACT

These experiments have been done aimed to prove that the water flea, *Daphnia magna,* can be intensively cultivated and grown on a variety of the food industry residues as well as algal powder under controlled culture conditions with no deficiencies. In mass culture experiments, population densities of 7000 to 10,000 individual per liter were obtained within 6 weeks with average yields ranged between 400 to 450 g/m^3/week, depending on the food type. Selective harvesting of the larger individuals (more than 1mm) at weekly scale has a beneficial return on the *Daphnia* culture as it gives the opportunity for smaller individuals to grow and stimulates them to reproduce. The average conversion ratio from different food used ranged from 2.27 to 2.55. The best food conversion ratio was obtained from soybean while wheat bran was the worst.

The current study concluded that *Daphnia magna* is considered as one of the most important zooplankton species that can be relied upon to feed fish larvae, due to its high content of animal protein that reached 47.7%, as well as the caloric value of 333.7 cal. (i.e. 1397.14 j/g dry weight). Also, these organisms have a rich source of various necessary vitamins and some vital antioxidants such as tannic acid and β-carotene in good proportions. On the other hand, analyzing the bacterial content of these organisms revealed that they are free from most common pathogenic bacteria such as *Escherichia coli*, *Salmonella*, and *Clostridium* in present culture conditions. In addition, the aflatoxin levels are very low and below the internationally permitted rates.

INTRODUCTION

Zooplankton is the main source of fish nutrition in their early stages, and with the increase in the number of fish farms, the need for them has increased, as the trend to cultivate zooplankton as a live food has increased significantly during the last decades, several food items have been used in feeding these organisms include agriculture and industrial waste products, and animal manures **(De Pauw *et al.*, 1980; Damle & Chari 2011; Zahidah *et al.*, 2012; Herawati and Agus, 2014** and **Herawati *et al*., 2015, 2017,**

2018). **Herawati *et al*. (2015)** mentioned that bran has high nutritional value and enhances the growth of *Daphnia magna*.

Daphnia magna Straus, 1820 is a micro-crustacean zooplankton organism belongs to Order: Cladocera, it has a body enclosed by shell-like structure (transparent carapace) that un-calcified but made of a polysaccharide materials called chitin. It has widespread overall freshwater bodies. Recently, it used for feeding of fish fry in aquaculture **(Barthelmes, 1969; Huet, 1970; Masters, 1975; Paray and Al-Sadoon, 2016)**. It is characterized by size suitable for the mouth opening of many fish larvae and fish fries such as *Oreochromis niloticus* as well as it has a high nutritional composition **(Nwachi, 2013; Gogoi *et al*., 2016**; **Herawati *et al*., 2017)**. Its nutrient content varies according to the culture medium and the degree of availability of phytoplankton **(Damle and Chari 2011; Herawati *et al.*, 2017)**.

The objective of this study was to determine the best food item that can be used as feed for *D. magna* in mass culture to improve its growth performance and biomass production.

MATERIALS AND METHODS

Specimen collection and their nutrients

The cladoceran species, *Daphnia magna* was isolated from Lake Mariout (one of the Egyptian northern lakes). A comparison was made between the results of the use of different nutrients to determine the best among these nutrients in terms of breeding of *Daphnia magna*. Therefore, they were fed on the following five different nutrients:

1. Spirogyra algal powder.
2. Rice bran powder.
3. Wheat bran powder
4. Yellow corn powder
5. Soybean powder

Food particles have been micronized to 60 microns to be suitable for efficient filtration by Daphnia **(Burns, 1968)**. Micronized operation was prepared and treated by a hand mixer. Weighted quantities of feed powder were suspended in water and added manually two times / day. Precipitations were siphoned every two days to exclude them from the bottom of tanks to prevent the anaerobic conditions.

Rearing Conditions

The rearing conditions were in transparent tanks (10 - 99 l) 12 hr. daylight and 12 hr. fluorescent light tubes, culture tanks received illumination of 5000 LUX at the side of these transparent tanks. Oxygenation of the tanks was assured by air bubbling, aeration cause water agitation which helps in regular redistribution of the organisms overall the culture water body following the method of **Dinges (1973)**. Replacement 25% of tank water was performed on a weekly scale by using de-chlorinated water. The environmental parameters were adjusted in the cultivation tanks where the temperature was set at 22 °C, salinity at 0.5 ‰, ammonia 0.02, pH 7.8, and oxygen was 5.5 mg/l. These parameters regularly measured twice a week to ensure that it does not change. The cultivation tanks were left without harvesting for five weeks to increase the cultivated numbers, and after that, the harvest was done on a weekly basis. The selectively harvest were performed by using 1mm screening net to harvest the large size individuals (>1mm), the neonates and smaller individuals were returned to the cultivation tanks.

Calculation of feeding rate:

Feeding rate was done according to the formula of **De Pauw *et al*. (1981)**.

$$\mathbf{Y= [(Log\ 10\ N/10) - 0.2]*V*d}$$

Where:
Y = quantity of feed (g) to be given per period.
N = population density (number of animals per liter)
V = volume of the culture in a liter
d = period (in days) for which food is given (in practice two or three).

Chemical analyses.

Daphnia magna chemical composition (moisture, crude protein, crude fat, carbohydrate, calories, fibers and ash) was analyzed according to the standard methods of **AOAC (1990)**. Moisture content was estimated by drying the samples to constant weight at 70 °C in a drying oven for 48 hr. While, Nitrogen content was measured using an Automatic Kjeldahl system (UDK 139, VELP Scientifica) and crude protein was estimated by multiplying nitrogen content. Lipid content was determined by ether extraction in multiunit extraction Soxhlet apparatus. Ash was determined by combusting dry samples in a muffle furnace at 550 °C for 3 hr.

Determination Physicochemical characters of the culture medium:

Water temperature was measured by using a mercury thermometer 110 °C graduated to 0.1 °C. The turbidity of water was measured by turbidimeter bench HACH 2100N (SN 08040CO2711). Hydrogen ion concentration (pH) values of the water were measured by using a digital pH meter (Levibond sensodirect pH200). The dissolved oxygen was measured by DO-meter (HQ30d Flexi meter HACH). For the determination of ammonium, the water fixed immediately and then ammonium was determined spectrophotometrically.

Analysis of bacterial and fungal content

The bacterial content of the harvested *Daphnia* was analyzed to ensure that it was free of pathogens and its suitability for use in feeding fish larvae. The total count of bacteria in the yields was calculated and their contents of *Salmonella*, *Clostridium*, *Listeria* and *Escherichia coli* were analyzed, as well as their yeast and molds content.

Analysis of vitamins and toxins content

Vitamins B2, B6, B12, A, D, E and folic acid, as well as the antioxidants as tannic acid and β-carotene contents, have been analyzed in the cultivated *Daphnia magna* to evaluate its nutritional value. On the other hand, the carcinogenic Aflatoxin has been analyzed to find out whether it is present in internationally permitted limits by the World Health Organization or not because it is one of the most dangerous known toxins, and therefore determine whether these organisms are actually valid for use in feeding of fish larvae or not.

Statistical analysis

All counts, calculations and weights were replicated 3 times. The obtained results were statistically analyzed using SPSS (version 20) for one-way analysis of variance. Differences between individual treatments were tested with Duncan Multiple Range Test at a probability level of 0.05% when the test was significant.

RESULTS

After five weeks of *Daphnia magna* cultivation, the maximum obtained density was 10000 individual/l from tanks feed with rice bran powder, followed by average of 9000 individual/l from that feed on soybean powder, it was noticed that the average number of *Daphnia* population that feeds on algal powder was similar to that feeds on yellow corn powder (8000 individual/l). On the other hand, the population which feed on wheat bran powder yielded the minimum average of population density among all the experiment tanks (7000 individual/l). Hence, the nutrients used in the current experiment can be arranged in terms of the best in producing *Daphnia* to rice bran, soybean, algal powder was equal to yellow corn and finally wheat bran (**Table, 1).** At the week 1 (W_1), there were no significant differences between the densities of the population that treated with algal powder, wheat bran, yellow corn and soybean powder, while all these treatments differed significantly with that treated with rice bran. On the other hand, the case changed at the end of the final week (W_5) as there were no significant differences between the density of the populations resulting from the nutrition with rice bran and those fed on soybean, which had been differed from the rest of the treatments.

Table 1. Weekly changing in *Daphnia magna* densities (individual/l) at different food types (Data were presented as: average ± SD)

Weeks	Algal powder	Rice bran powder	Wheat bran powder	Yellow corn powder	Soybean powder
W_0 (ind./ l)			67		
W_1 (ind./ l)	2000^{a} ±0.7	$3000^{a b}$ ±0.2	2000^{a} ±0.0	2000^{a} ±0.0	4000^{a} ±0.0
W_2 (ind./ l)	3000^{b} ±0.0	$4000^{a b}$ ±0.6	2000^{b} ±0.1	3000^{b} ±0.0	$5000^{a b}$ ±1.0
W_3 (ind./ l)	6000^{a} ±0.31	7000^{a} ±0.4	$4000^{a b}$ ±2.0	$5000^{a b}$ ±2.0	8000^{a} ±0.0
W_4 (ind./ l)	$7000^{a b}$ ±0.5	8000^{b} ±0.0	5000^{b} ±0.2	$6000^{a b}$ ±0.0	8000^{ab} ±3.0
W_5 (ind./ l)	8000^{b} ±0.0	10000^{abc} ±1.0	7000^{b} ±0.0	8000^{b} ±0.2	$9000^{a bc}$ ±0.0

Averages in the same row sharing the same or none superscript letter are not significantly different, as determined by Duncan's test ($p > 0.05$).

The nutritional content of *Daphnia* that was isolated was analyzed to determine its efficacy as food for fish larvae, as well as the difference between the concentrations of its contents from those used in other studies. The obtained data showed that the protein content of *Daphnia magna* was 47.7% and fats was 6.1 while ash and carbohydrate recorded 15.6% and 20% respectively. On the other hand, calories recorded 391.1 (**Table 2**).

Table 2. Chemical composition and nutritional values of *Daphnia magna* (% of its dry weight "DW")

Chemical composition	Value
Moisture %	6.6
Crude protein (CP) %	47.7
Ether extract (EE) %	6.1
Ash %	15.6
Total carbohydrate %	20
Fibers %	8.6
Calories	333.7

Feeding rate

In the current experiment, the feeding amount has been started with 0.08 g/l of nutrient powder/day for the population density 1 individual/15ml, approximately 67 individual/l, the introduced amount of feeding powder has been increased as the increasing of the numbers of the cultivated individuals per liter **(Table 3)**. The quantity was divided into two halves, to be fed twice a day.

Table 3. Weekly variations in food amount (g/l) at different experimental food types of *Daphnia magna* biomass cultivation

Weeks	Algal powder	Rice bran powder	Wheat bran powder	Yellow corn powder	Soybean powder
W_0			0.08		
W_1	0.23	0.25	0.23	0.23	0.26
W_2	0.25	0.26	0.23	0.25	0.27
W_3	0.28	0.28	0.26	0.27	0.29
W_4	0.28	0.29	0.27	0.28	0.29
W_5	0.29	0.30	0.28	0.29	0.30
Total/6weeks	**8.46**	**8.78**	**8.13**	**8.38**	**8.92**

Daphnia yield in Biomass cultivation

In the present scale experiments (culture water volume 10-130 l), *Daphnia* population densities can rise up to 10000 and more individual per liter was obtained within 5 weeks. The average amount of weekly harvest after the first 5 weeks was 450 g wet weight/m^3/week. This species has been intensified and the product was harvested and dried (50 $^{\circ}$C for 24 hours). The obtained dry weight does not include the weight of the small size individuals (lesser than 1 mm) or the eggs. The cultivated individuals reached maturity after 7 days, at a length of approximately 1.5 mm and harvested by 1 mm screening net to harvest the individuals larger than 1 mm on a weekly scale.

Food conversion ratio

After harvesting the cultivated adult individuals, the average numbers of the remaining small individuals which remain for starting the next week was 600 individual/l, the calculated total amount of food that gives daily was 0.18 g/l/d which is equivalent average of 1080 g/m^3/week, the obtained average *Daphnia* wet weight harvest is 450g/week. The average corresponding conversion ratio from food to *daphnia* was 2.4 to 1, this means that 2.4 kg of food powder can produce 1 kg of wet *Daphnia* biomass **(Table 4)**. The obtained yields were between 400 and 490 g wet weight/m^3/week with corresponding food conversion ratios between 2.55 to 2.27. It was noticed that rice bran powder gives the highest productivity as well as the highest food conversion ratio among all food items used.

Table 4. Total biomass (wet weight) of the harvest *Daphnia* culture, the amount of food used and the food conversion ratio after using different food items

Variables	**Algal powder**	**Rice bran powder**	**Wheat bran powder**	**Yellow corn powder**	**Soybean powder**	**Average** ±SD
Initial average number (ind.)	535	750	500	580	650	**600±99.47**
food weight (g/l/d)	0.173	0.188	0.170	0.176	0.181	**0.180±0.01**
food weight (g/m^3/d)	173	188	170	176	181	**180.0±6.99**
Total food (g/m^3/w)	1037	1125	1019	1058	1088	**1080±41.93**
Total yield (g/m^3/w)	430	490	400	450	480	**450±36.74**
Conversion ratio	**2.41**	**2.30**	**2.55**	**2.35**	**2.27**	**2.40±0.11**

d: day; w: week

Microbial analysis

Results of the bacterial content analysis for the harvested *Daphnia* (**Table, 5)** showed a total bacterial number was >6500*10^2 CFU/g unclassified nonpathogenic bacteria, while the harvest was completely free of dangerous bacteria like *Salmonella* sp., *Clostridium* sp., and *Escherichia coli*, while *Listeria* sp. was found in a relatively low count (10 CFU/g).

Table 5. The bacterial contents and their counts of the harvest from pathogenic bacteria, as well as yeast and molds (CFU is a colony-forming unit that means: the number of viable bacteria or fungal cells in a sample)

Bacterial types	**Counts**
E. coli (CFU/g)	0.0
Yeast & molds (CFU/g)	0.0
Salmonella (CFU/25g)	0.0
Clostridium (CFU/25g)	0.0
Listeria (CFU/g)	10
Total count (CFU/g)	**> 6500*10^2**

Vitamins and toxins content

The obtained results showed that the farmed *Daphnia magna* contained most of the vitamins necessary for the growth and improvement of the health status of fish larvae as they contained vitamins B2, B6, B12, A, D, E and folic acid in good proportions. It was also surprising that these organisms contain tannic acid and beta-carotene which are considered among the most important antioxidants. It was also observed that these organisms contain very low levels of the toxic compound aflatoxin **(Table 6)**.

Table 6. Different values of vitamins, antioxidants and aflatoxin inside *Daphnia magna* harvest

Items	Value
Vitamin B2 (mg/100g)	203.727
Vitamin B6 (mg/100g)	176.673
Vitamin B12 (mg/100g)	191.477
Vitamin A (IU/100g)	318.781
Vitamin E (mg/100g)	17/823
Vitamin D (mg/100g)	19.272
Folic Acid (µg/100g)	110.446
B-carotene (IU/100g)	6510.219
Tannic acid (mg/100g)	56.643
Aflatoxin B1 (ppb)	9.530

DISCUSSION

This species has been chosen because it's rapid ability to adapt to laboratory conditions, as well as its great ability to withstand environmental conditions, in addition to its large productivity and rapid life cycle **(Barthelmes, 1969; Huet, 1970; Ivleva, 1973; Masters, 1975; De Pauw *et al*., 1981)**. Aeration is a necessary procedure in Daphnia culturing especially in the large scale culture as the dense populations exhausted the dissolved oxygen, also the air bubbles cause agitation of food items over all the cultivation area Which maximizes the benefit from food and evenly redistribute the food particles and the organisms in the culture water, **De Pauw *et al*. (1981)** stated that the stagnant condition in the cultivation tank causes accumulation of the faeces and food particles on the bottom and along the water-column result in declining the water quality inside the culture. Also, **Heisig (1979)** informed that aeration is an effective process as it excites the *Daphnia* to reproduce. Likewise, partial replacements of aquaculture water (25%) is considered a necessary procedure that improves the characteristics of the culture environment and also works to induce individuals to reproduce, this was confirmed by **De Pauw *et al* (1981)** (25% replacement), and **Herawati *et al* (2018)** (substitution at a rate of 20-25%).

The water quality parameters in the farming tanks at the current study were to somewhat range around the advised values with several authors such as **Nina *et al*. (2012), Herawati *et al*. (2017)** and **Herawati *et al*. (2018)**, they mentioned that the ideal condition for *Daphnia* rearing is found when temperature not rising than 30 °C, pH value from 6.5 to 9, and dissolved oxygen ranged between 0.3 and 0.6 ppm was setting at 22 C°, salinity at 0.5 ‰, ammonia 0.02, pH 7.8, and oxygen was 5.5 mg/l.

The micronization of food item to become in a size suitable for efficient filtration during *Daphnia* feeding is a necessary operation that commonly used in these organisms cultivation as it previously used by various authors like **Sorgeloos *et al.* (1980)** and **De Pauw *et al*. (1981)**. The current data indicated that the rice bran as a rice manufacturing waste product is one of the best food items that can be used in mass production of *Daphnia magna*, this indication was previously proved by several authors (**Sorgeloos *et al.*, 1980; De Pauw *et al.*, 1981)**. They have also indicated their effectiveness in feeding cultured *Artemia*.

Experiments in plastic tanks with volumes up to 130 liters (0.66m length X 0.47m width X 0.42m height) (cultivation volume 100 l) have proven that *Daphnia magna* can be successfully grown on a variety of feeds but with controlling the environmental conditions. Fortunately, rice bran is distinguished from other foodstuffs used in culture with a number of advantages, which include its availability in large quantities at a low price and can also be stored for long periods without corruption, as well as it can be used directly after a simple micronization process. Soybeans came second in terms of preference for use and then algae powder except that their high prices, as well as the algae farms, come with many risks including sudden mortality and the high nutrient costs that are used in fertilizing algae farms are obstacles to their use on a large scale **(Soeder, 1978; De Pauw *et al*., 1980, De Pauw *et al*., 1981; Darmawan, 2014)**.

Herawati has carried out numerous studies on the cultivation of *Daphnia* using various feed **(Herawati, 2015, 2016, 2017, 2018)**. He did a special procedure, as he had always added probiotic bacteria to the used nutrients (different animal manure, rice bran and coconut oilcake) to ferment them before starting to feed the organisms, the author assumed that the fermentation process for 28 days before feeding enhances the nutrient quality in culture medium as the fermentation by *Lactobacillus* sp. bacteria increase the protein value. This also confirmed by the finding of **Hersoelistyorini *et al*. (2010); Damle and Chari (2011)** and **Nwachi (2013). Herawati (2018)** reached to huge numbers of *Daphnia magna* populations, 136460 individuals per liter after 20 days and a total of 683.06 g after 28 days; therefore, this procedure will be tried in the upcoming studies.

The experiment began with *Daphnia* population density was approximately 67 individual/l, and based on the equation of **De Pauw *et al*. (1981),** they have been fed on the quantity of 0.08 g/l of nutrient powder/day, this quantity did not fall below the permissible minimum limits according to **De Pauw *et al*. (1981)** (not lesser than 0.06), as it becomes difficult for the organism to perform effective food filtration operations below this level.

The amount of food used in the experiment was calibrated regularly according to the difference in population density. So that this quantity was adjusted to be not less or more than the calculated values due to the fact that its decrease leads to a decrease in the growth and reproduction rates, as well as its increase comes with many risks represented in the decrease in the quality properties of the culture water, which results in mass mortality of the cultivated *Daphnia* populations, likewise, daily feeding and dividing the amount of food on two periods gives the best benefit to the cultivated organisms, as mentioned by many authors like **Schindler (1968), Burns (1969)** and **De Pauw *et al.* (1981)**. They pointed out that the multiplicity of periods for adding food and not exceeding successive feeding for more than 2-3 days give the best results.

The caloric value of the cultivated Daphnia in the current experiment (333.7 cal., i.e: 1397.14 j/g) is less than those recorded by **Richman (1958), Schindler (1968), Kersting (1978),** and **De Pauw *et al.* (1981)**, around 17000 j/g for these fed on fermented food items and microalgae. Protein content was 47.7% which relatively equal to that recorded by **Winberg *et al*. (1934) in Ivleva (1973)** and **De Pauw *et al*. (1981)** (45-50%). On the other hand, the obtained values were lower than that recorded by **Herawati *et al*. (2018)** where he recorded 75.26% protein content and 7.84% fat for *Daphnia* feed on fermented food and protein and fat 40.86% and 3.23% content for that feed on unfermented food items.

Although harvesting large sizes is a stressful and time-consuming process, it carries many benefits as it gives an opportunity to produce young as well as increase production by more than 45%, as **De Pauw *et al*. (1981)** mentioned. Harvesting for large sizes and leaving small ones leads to many benefits, such as improving the characteristics of the culture environment and stimulating the remaining species to reproduce, which leads to an increase in the numbers of ovigerous females. This phenomenon was observed by both **Heisig (1979)** and **De Pauw *et al*. (1981)**, who noted that leaving the farms without harvest for a long time leads to reducing the numbers of offspring due to the increase in the length of time needed to reach the reproductive stage.

In general, the yields obtained using the current food items are somewhat promising (490, 480, 450, 430, and 400 g wet weight/m3/week from rice bran powder, soybean powder, yellow corn powder, algal powder, and wheat bran powder, respectively) as they are higher than the results obtained by **Ivleva (1973)** who used horse manure and obtained a result of 350 g/m3/week as well as **De Pauw *et al*. (1980)**, which used pig manure and produced 35 to 250 g/m3/week, while others who used microalgae in nutrition produced various amounts ranging from 100 to 700 g/m3/week (**De Pauw *et al*., 1980**). The results of the use of rice bran in the current experiment, 490 g/m3/week, are considered relatively less than the results obtained by **De Pauw *et al*., 1980** (600 g/m3/week). Rice bran gave the best food conversion ratio among used foods (average of 2.3), while **De Pauw *et al*. (1981)** got relatively better results (average 1.7) perhaps because his cultivation period was longer, and this is confirmed by the low results he obtained in his experience before that of **De Pauw *et al.* (1980)**.

The aflatoxin B1 values within these organisms were very low, 9.530 ppb, it less than the permitted values of the United States Food and Drug Administration which ranged from 20-300 ppb **(FDA, 2013)**. These organisms also contained high levels of important vitamins, as well as two of the most important antioxidants, tannic acid and beta-carotene, in addition to these organisms, are considered free from many pathogenic bacteria, which makes the use of these organisms as food for fish very beneficial and safe for animals and human health.

CONCLUSION

Based on the obtained data in the present study, *Daphnia magna* is one of the zooplankton organisms with excellent nutritional content that is recommended for use in feeding fish larvae. Also, many nutrients of low economic value can be used in feeding these organisms for mass production, especially rice bran, with controlling the water characteristics used in the culture.

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ARABIC SUMMARY

تأثير التغذية بأنواع مختلفة من المغذيات على الاستزراع المكثف لمتفرعات القرون دافنيا ماجنا

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لقد أثبتت تجارب التربيه بمواد غذائية مختلفة إمكانية ان تستزرع الـ *Daphnia magna* استزراعاً مكثفاً وتنمو على مجموعة متنوعة من بقايا صناعة المواد الغذائية وكذلك مسحوق الطحالب تحت ظروف استزراع محكومة دون أي قصور.

في تجارب الإستزراع المكثف، تم الحصول على كثافات من مجتمعات الدافنيا تراوحت مابين ٧٠٠٠ إلى ١٠,٠٠٠ فرد لكل لتر في غضون ٦ أسابيع بمتوسط كتلة حية تراوح مابين ٤٠٠ إلى ٤٥٠ جم/م٣/أسبوع، وهذا يتوقف على نوع الغذاء المستخدم. ولقد لوحظ أن الحصاد الانتقائي للأفراد الأكبر حجمًا (أكثر من ١ مم) على نطاق أسبوعي كان له مردوداً إيجابياً على الدافنيا المستزرعة نظراً لأنه يتيح الفرصة للأفراد الأصغر حجمًا للنمو كما أنه يحفز الأفراد المتبقية بعد الحصاد على التكاثر. وكان متوسط نسبة التحويل من الأغذية المختلفة المستخدمة إلى كتلة حية من الدافنيا (وزن رطب) ٢.٤، ولقد تم الحصول على الحد الأقصى لمعدلات التحويل من التغذية باستخدام فول الصويا بينما أعطت نخالة القمح أقل معدلات تحويل بين جميع الأغذية المستخدمة.

أثبتت الدراسة الحالية أن الدافننيا ماجنا تعتبر واحدة من أهم أنواع العوالق الحيوانية التي يمكن الاعتماد عليها فى تغذية يرقات الأسماك ونذلك نظرا لمحتواها المرتفع من البروتين الحيوانى الذى وصل إلى ٤٧.٧ ٪ ، وكذلك قيمة السعرات الحرارية بها ٣٣٣.٧ كالورى أي ما يعادل ١٣٩٧.١٤ جول بكل ١ جم وزن جاف. وكذلك فإن هذه الكائنات تعد مصدرا غنيا بالفيتامينات المختلفة حيث تحتوي هذه الكائنات على عدد من أهم أنواع الفيتامينات الضرورية وبنسب جيدة، كما أظهرت الدراسة الحالية أن تلك الكائنات تحتوى على بعض مضادات الأكسدة الهامة مثل حمض التانيك والبيتا كاروتين، وبتحليل المحتوى البكتيرى لتلك الكائنات أظهرت النتائج خلوها من معظم أنواع البكتيريا المسببة للأمراض مثل العصيات القولونية (*Escherichia coli*)، والسالمونيلا (*Salmonella*)، المجزآت المغزلية المِطَثِّيَّة (*Clostridium*) في ظروف الاستزراع الحالية. بالإضافة إلى ذلك، فإن مستويات الأفلاتوكسين منخفضة للغاية وأقل من المعدلات المسموح بها دوليا.