Organic Red Dyed Pellet for Red Cherry Shrimp (*Neocaridinadavidi*)

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ABSTRACT

Attractive colouration of ornamental shrimp determines its commercial value. More color means a good business. Pigmentation in the shrimp exoskeleton is responsible for colouration in the shrimp. Moreover, carotenoids are the key source of that pigmentation. There are various of synthetic carotenoid that are chemically made in order to mimic the natural feeding sources in the wild. However, the synthetic carotenoid is expensive and more important, cause pollu-tion to the environment during manufacturing. Due to that, the objectives of these research is to use natural sources of carotenoid as an alternative by using roselle extract. Previous study shows, natural carotenoid extracted from carrot, hibiscus, pandan leaves, pea flower and green microalgae was more effective in enhancing the colour of ornamental organism. The researchers also proved that natural carotenoid was highly economical and user friendly. The method has been done by extracting the color from roselle by boiling the flower until concentrated solution is achieved. Then, this solution was fused into the starter pellet by bath technique. Then it was rinsed and dried. After the test feeding, the pigmentation appeared on the exoskeleton of the shrimp was compared by using standard red scale color by comparing the changes of color intensity from day 1 until day 40th. The result also was evaluating by comparing the color changes of experimental and controlled shrimp. The result shows significant effect between experimental and control. Red cherry shrimp that has been give enhanced β -carotene diet shows more vibrant colors compare to control. It proves that organic approach is better than chemicals. This also shows that sustainable aquaculture is there.

INTRODUCTION

Organic Approach

Colour plays a major role in the overall preference of any pet animals. As fish/shrimp cannot synthesize pigments into their body, they rely upon dietary supplementation of carotenoids to maintain their natural colouration [1]. Previous research shows several natural ingredients has been used such as red yeast [2], spirulina [3], blue green algae [4], azolla and others carotenoid source [5]. According to Vasudhevan et al. (2013) each fish has a specific capacity to utilize carotenoids from diet [6].

For this present research, plant based extract has been used in order to replace red synthetic component in the pellet. The chosen of this plant is mainly because the safety of the color extract that has been produced by referring to the widely utilization in human food and also the availability of these plant. The replacement of these organic extract into the pellet has been tested successfully through the observation data that has been taken by photo documentation of changing of scale colour.

Pigmented Scale for Ornamental Fish/ Shrimp

Fish feed and feeding is everything in aquaculture to ensure fish growth. But that's applied to food fish only where we want to achieved certain weight in one production cycle. Different to ornamental fish, the model for pellet purposes applied for food fish is not relatable. In ornamental fish, the main purpose of feed is to enhance the color of body scale, sporting their best colors and brightening the aquarium, because the value of ornamental fish depends on it [7]. Though, the purpose for growth becomes the second aims.

Normally, to achieved the significant colour in ornamental pellet, synthetic dyes such as yellow, green, blue and red has been corporates into the pellet. This has been practise widely in commercial feed and feeding for every ornamental species [8].

Chemical Substance / Synthetic Carotenoid

Synthetic dyes that has been used to pigment the pellet have harmful effects which can damage skin scale if used for long term and sometime cause negative impact on fish metabolism [9]. First off, it made up of chemical compounds that can be harmful to humans, especially those who work and exposed directly in their production. Some of the chemicals found in synthetic dyes are mercury, lead, chromium, copper, sodium chloride, toluene, and benzene.

Exposure to large doses of these substances can be toxic and can have severe effects in the human body [10]. Other than that, it also damaging the environment during manufacturing process. Mostly it causes water pollution when untreated dye effluent is dumped directly on bodies of water [11].

Red Cherry Shrimp

Red Cherry Shrimp or their scientific name is *Neocaridinadavidi*, is a kind of bright red decorative shrimp. The market value of this shrimp are based on the visual appearance of the color on its body. Beautiful red vibrant color shrimp can go up to Rm 20/ ind [12]. The main red pigment agent for this shrimp is a carotenoid pigment. Carotenoids provide from red to orange tissues pigmentation.

The formation of pigment in shrimp occurs mainly due to the absorption of carotenoids from their own diet. In the natural environment, shrimp meet their carotenoid needs by digesting aquatic plants such as algae, or through their own food chain. The color of the shrimp is important in terms of camouflage and reproduction. Shrimps do not have their own ability to synthesize carotenoids. Therefore, coloring agents synthesized by plants, algae and microorganisms should be included in their diet to promote pigmentation in the shrimp body.

Carotenoid

Carotenoid are among the 800 classes of natural soluble fat pigments found mainly in plants, algae, photosynthetic bacteria as well as some non-photosynthetic bacteria and they play an important role in the photosynthetic process. Carotenoids are responsible for red, orange and yellow pigment. It is also plays a role of other important functions such as pro-vitamin A, antioxidants, immunization and can also promote functions in reproduction.

Based on observations made by previous studies, fish with high levels of carotenoids were found to be more resistant to bacteria and fungal diseases. However, its effect on ornamental shrimp is not to be known yet. Due to the high cost of synthetic carotenoids, natural sources of carotenoids can be used as an alternative source for breeders [13].

β-Carotene

Generally, Red Cherry Shrimp are red to orange in color. Therefore, the appropriate source of carotenoid pigment for this shrimp is β-carotene. β -carotene is a carotenoid that is specifically responsible for the reddish orange pigment.

Roselle Flower

Roselle flower, is a plant of the hibiscus, has been widely cultivated in Malaysia for beverages, sauces, jellies, salads, or cooked vegetables [14]. The red intense color of the petals is high in beta carotene. Significantly, this research was able to provide safe organic pellet that will be consumed to the red cherry shrimp where it will show red vibrant color

EXPERIMENTAL

Research Design

The experimental design of this research was pictured as in Figure 1. It started by sampling and collecting the dyed natural sources. In this research, the roselle flower sample has been purchased online due to more convenience.

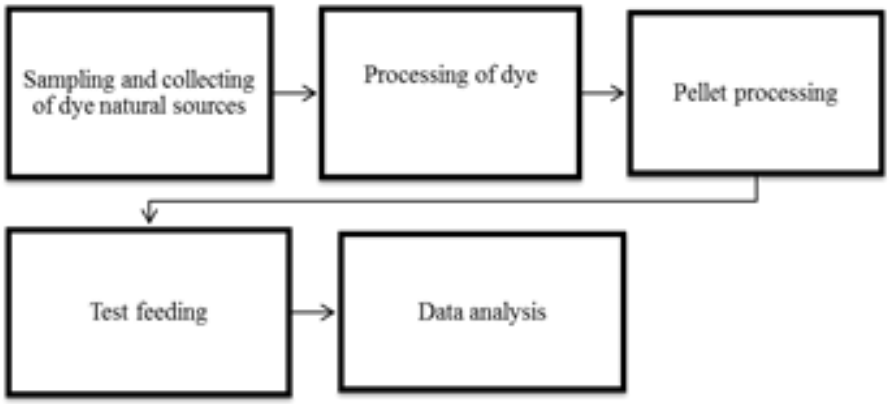

Figure 1. Flow chart diagram of research design.

Processing of Dye /Roselle Flower Extraction

1kg of roselle flower has been purchased online and was cut into pieces and blended with 100ml of water until smooth consistency. The blended flower petals have been filtered and were kept into -20-degree freezer to kill the bacteria.

Pellet Processing

300g of starter pellet has been sprayed with the roselle extract gradually and has been air dried each time.

Test Feeding

3 replicate/tank of experimental pellet which contain 33 individual of red cherry shrimp for each replicate/ tank. There is also 3 tank for commercial/control pellet. The duration of the

experiment was 40 days to see the differences of fish scale that measured by using standard red range scale colour. The experiment has been done in controlled parameters.

Data Collection / Analysis

During the 1st and 40th days of test feeding, observation data has been taken by photo documentation of scale. The coloration of the fish scale has been compared with standard red scale with 9 densities. The scale 9 is the most intense while scale 1 is the most fade colour.

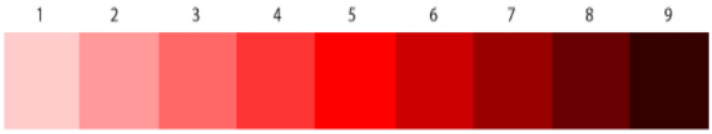

Figure 2. Standard red scale colour.

RESULTS AND DISCUSSION

Results indicates that, experimental and control tank 1 with red cherry shrimp fed with organic dyed pellet shows exoskeleton color changes from scale 2 become scale 6 while for control from 2 to scale 4. Then, for tank 2 shows scale 1 becoming scale 4, and for control changing from 1 to scale 2. Lastly, for tank 3, shows changing from scale to 1 to 4 and same goes with control. These results shows that natural or organic pigmentation shows better results in scale colour transition.

This result has been supported by others research that also has been using natural colour in the pellet diet. Research conducted by Okada et al., 1991 [15] titled effects of spirulina powder in coloration and growth enhancement of ornamental fish Trichogasterlalius shows impact in pigmentation of the respective fish in the captive condition.

Natural carotenoids provide better coloration to fishes. Several authors [12-15] used natural carotenoid source to increase the coloration of various ornamental fish colour. Ako et al. (2000) found that cichlids fish became significantly coloured when they fed a diet containing Spirulina platensis [12].

This shows that, by using organic ingredients rather than synthetic, carotenoids were absorbed in red cherry shrimp diet like what has been practise by shrimp in their natural habitat where they consume wild plant/animal with quality required for proper growth, pigmentation, as well as nutrient profile.

While, from the result also indicates that the scale changes for the control fish shows little colour transition compared to the experimental fish.

CONCLUSION

The ability of natural component in the dye extract might mimic the natural eating behaviour of the fish in wild habitat and it is more suite the exoskeleton colour development. The successful story of sustainable aquaculture should come from different aspect and one of it is ornamental industry. Using organic dye pellet commercially with ensure the sustainable agenda will be achieved.

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