

## Effect of Natural Dye Pellet from Pandan Leaves, Pea Flower and Turmeric Powder Extract to Betta Fish Scale Pigmentation

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### ABSTRACT

*This study has been conducted to produced pigmented pellet from natural resources and to observe the changing of scale colour after test feeding. Natural sources that has been used was pandan leaves which produced green extract, pea flower producing purple blue colour and turmeric powder produced yellow extract. Natural colour was the best choice due to harmless component contains in it. Organic based pigmented pellet also is cheaper because the source of these three component is abundant. The research design began with sampling and collecting the source, dye processing, pellet processing, test feeding to betta fish and data analysis. During the 8 weeks of test feeding, observation data has been taken by photo documentation of scale. The coloration of the fish scale has been compared with standard green, blue and yellow scale with 5 densities. The scale 5 is the most intense while scale 1 is the most fade colour. Commercial pellet has been used as comparison with experimental pellet. Results show that, Experimental yellow betta fish shows changes from scale 2 become scale 4 while for control from 2 to scale 3. Then, for experimental blue green betta fish shows scale 1 becoming scale 4, and for control changing from 1 to scale 2. Lastly, experimental blue betta fish scale shows changing from scale to 2 to 4 and same goes with control. These results shows that natural or organic pigmentation shows better results in scale colour transition. This might show that the natural component in the dye extract might mimic the natural eating behaviour of the fish in wild habitat and it is more suite the scale colour development. The successful story of sustainable aquaculture should come from different aspect and one of it is ornamental industry. Using natural dye pellet commercially with ensure the sustainable agenda will be achieved.*

### INTRODUCTION

#### Siamese Fighting Fish / Betta Fish

The Siamese fighting fish (*Betta splendens*), also known as the betta, is a popular fish in the aquarium trade. Bettas are a member of the gourami family. *B. splendens* usually grows to a length of about 7 cm (2.8 in) [1]. This aquarium specimens are widely known for their brilliant colors and large, flowing fins, the natural coloration of *B. splendens* is generally green, yellow and blue. In the wild, they exhibit strong colors only when agitated. In captivity, they have been selectively bred to display a vibrant array of colors and tail types [2].

In Malaysia, this species faced good demand in ornamental as well as commercial lfish market and sold as good as RM80.00 per pair while sold as ornamental purposes. It also has a high foreign demand as aquarium fish. It is naturally collected and exported to foreign countries such as USA, Japan, Sri Lanka, Germany, Taiwan, Thailand, Bangladesh, and China. Male betta is larger than female in size and possess a good market demand due to having vibrant colour with large caudal fin, where females are dull in colour and smaller [3].

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## **Pigmented Scale for Ornamental Fish**

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 [4]. Though, the purpose for growth becomes the second aims.

Fish 'skin' has chromatophores, a type of cell that contains color pigments. These pigments utilize carotenoids to bring forth shades of yellow (Xanthophylls), red and orange (Carotenoids), and brown and black (Melanin). Genetics dictate where these colors are, while the diet impacts the actual pigment.

Normally, to achieved the significant colour in ornamental fish 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.

### ***Research Problem***

#### ***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 [5]. 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.

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.

### **Organic Approach**

#### ***Research Objectives***

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

For this present research, three plant based extract has been used in order to replace the yellow, green and blue synthetic component in the pellet. The chosen of these 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.

#### ***Pandan Leaves (*Padanus amaryllifolius*) Extract***

Pandan leaves is a tropical plant in the Pandanus (screwpine) genus, which is commonly known as pandan, and is used widely in South Asian and Southeast Asian cooking as a flavouring [7]. Apart from the vast availability of these plant, it also has been chose due to its aroma. The

characteristic aroma of pandan is caused by the aroma compound 2-acetyl-1-pyrroline, found in the lower epidermal papillae [8]. These aroma is actually can be as attractant to fish with high feed selectability. The extract from pandan leaves producing green color.

***Pea Flower (Clitoria ternatea) Extract***

Clitoria ternatea, commonly known as Asian pigeonwings bluebellvine, blue pea, butterfly pea, cordofan pea and Darwin pea, is a plant species belonging to the family Fabaceae [9]. In Southeast Asia, the flower is used as a natural food colouring to colour glutinous rice. In Kelantan, east part of Malaysia, by adding a few buds of this flower in a pot while cooking white rice will add bluish tint on the rice which is served with other side dishes and such meal is called nasi kerabu. The extract from pea flower producing the purple blue color.

***Turmeric Roots (Curcuma longa) Powder Extract***

Turmeric is a types of herb. In human food processing, the turmeric rhizomes are used fresh or boiled in water and dried, after which they are ground into a deep orange-yellow powder commonly used as a coloring and flavoring agent in many asian cuisines, especially for curries, as well as for dyeing [10]. The widely used in human cooking making trumeric is widely grown plant with cheap price.

**METHODOLOGY**

**Research Design**

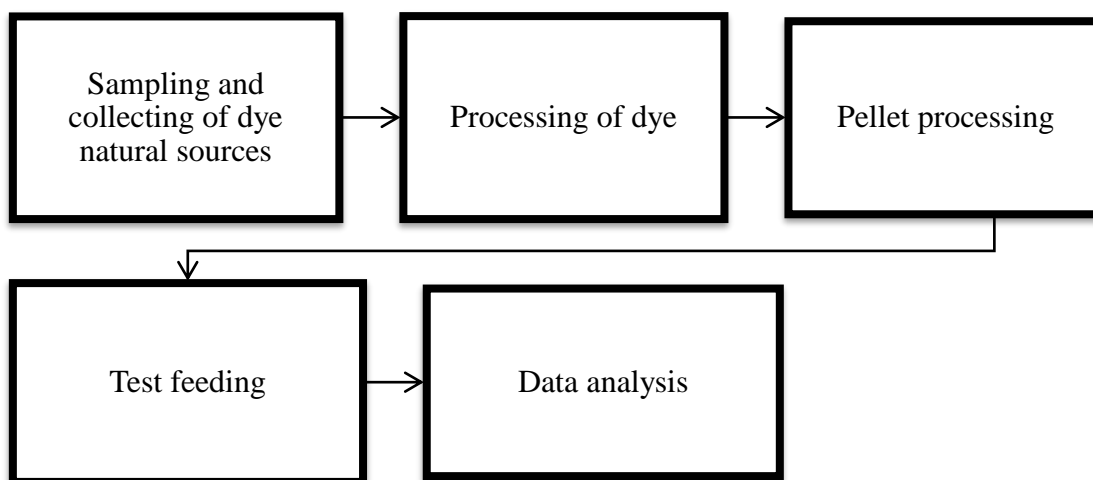


Figure 1. Flow chart diagram of research design.

***Sampling and Collecting of Dye Natural Sources***

***Pandan leaves and pea flower extract***

1kg of pandan leaves and pea flower has been sample nearby place and was cut into pieces and blended with 500ml of water. The blended leaves and flower has been filtered and boiled until reduce to 100ml of extract.

### ***Turmeric root powder extract***

1 kg commercial turmeric powder has been bought at nearby shop.

### ***Pellet Processing***

300g of starter pellet has been crushed into powder. 10ml of concentrated Pandan leave and pea flower extract has been infused into the powder pellet by mixing. The mixing component has been shaped into dough like and pelleting process has been done. For turmeric powder, 300g of powder starter pellet also has been incorporate through same process using 50g of turmeric powder.

### ***Test Feeding***

Nine betta fish, which three for each treatment represent 2 for experimental and 1 for control feeding the commercial pellet. The duration of the experiment was 4 weeks to see the differences of fish scale that measured by using standard green, yellow and blue range scale colour.

### ***Data Collection / Analysis***

During the 8 weeks of test feeding, observation data has been taken by photo documentation of scale. The coloration of the fish scale has been compared with standard green, blue and yellow scale with 5 densities. The scale 5 is the most intense while scale 1 is the most fade colour. Commercial pellet has been used as comparison with experimental pellet (Figures 2 - 4).



**Figure 2.** Standard green scale colour.



**Figure 3.** Standard blue scale colour.



**Figure 4.** Standard yellow scale colour.

## **RESULTS AND DISCUSSION**

Results shows that, experimental yellow betta fish which fed with turmeric dyed pellet shows changes from scale 2 become scale 4 while for control from 2 to scale 3. Then, for experimental blue green betta fish which fed with pandan extract dyed pellet shows scale 1 becoming scale 4, and for control changing from 1 to scale 2. Lastly, experimental blue betta fish scale which fed with pea flower extract dyed pellet shows changing from scale to 2 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 [11] titled effects of spirulina powder in coloration and growth enhancement of ornamental fish *Trichogaster lalius* shows impact in pigmentation of the respective fish in the captive condition.

Natural carotenoids provide better colouration 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 betta fish diet like what has been practise by fish 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 scale colour development. The successful story of sustainable aquaculture should come from different aspect and one of it is ornamental industry. Using natural dye pellet commercially with ensure the sustainable agenda will be achieved.

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