

## A Survey on the Awareness and Acceptance of Genetically Improved Farmed Tilapia (GIFT)

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**Abstract:** Genetically Improved Farmed Tilapia (GIFT) is one of the potential fish species to help increase aquaculture production in Malaysia. GIFT is a product of the collaborative work between Fisheries Research Institute (FRI) and WorldFish. Despite the many advantages of GIFT, preliminary value chain analysis by FRI indicated that it is not favored by the farmers because of its appearance. To further substantiate this claim, a survey was conducted to evaluate the public awareness and acceptance of GIFT. A total of 152 questionnaires were handed out to visitors at the Malaysia Agriculture, Horticulture and Agro-Tourism Exhibition (MAHA). The results showed that more than half of the respondents (62.5%) were not aware of the existence of GIFT. A sensory evaluation of consumer acceptance testing was done on 99 individuals, using a 7-point hedonic scale (ranging from overall likability to extreme dislikability) to determine the level of acceptance of GIFT. The overall acceptance was high (more than 80%) for all attributes (odour, taste, texture and appearance) of the GIFT tested.

**Keywords:** Awareness, GIFT, Acceptance, MAHA, Survey

**Abstrak:** Tilapia yang ditambahbaik secara genetik (GIFT) adalah spesies yang berpotensi bagi membantu meningkatkan produktiviti akuakultur di Malaysia. GIFT adalah produk utama yang dihasilkan dari kerjasama antara Institut Penyelidikan Perikanan (FRI) dan WorldFish. Meskipun GIFT mempunyai pelbagai kelebihan, laporan awal analisis rantai nilai oleh FRI menunjukkan GIFT tidak digemari penternak disebabkan rupa fizikal. Oleh itu, satu kaji selidik telah dijalankan untuk menilai kesedaran awam dan tahap penerimaan pengguna terhadap GIFT. Sejumlah 152 borang soal selidik telah diagihkan di kalangan pengunjung Malaysia Agriculture, Horticulture and Agro-Tourism Exhibition (MAHA). Keputusan menunjukkan lebih separuh daripada responden (62.5%) tidak menyedari akan kewujudan GIFT. Penilaian sensori melalui ujian penerimaan pengguna telah dijalankan ke atas 99 individu menggunakan skala hedonik 7 peringkat (suka hingga sangat tidak suka) untuk menentukan darjah penerimaan GIFT. Penerimaan keseluruhan adalah tinggi (lebih daripada 80%) untuk semua ciri (bau, rasa, tekstur dan rupa) yang diuji.

### Introduction

Tilapia is not only recognized as one of the most important aquaculture species of the 21<sup>st</sup> century in Malaysia but also globally. According to the Annual Statistics of the Department of Fisheries' (DoF) 2017, red tilapia production reached up to 25,648 metric tonnes (MT) valued at RM 250 million. Black tilapia on the other hand contributed about 5,895 MT in terms of production, worth about RM 40 million. The Genetically Improved Farmed Tilapia (GIFT) is an important achievement from the collaborative work of the Fisheries Research Institute, Malaysia and the WorldFish or formerly known as ICLARM (International Centre for Living Aquatic Resources Management). The GIFT strain was originally developed by ICLARM in collaboration with institutions in the Philippines (Central Luzon University, Bureau of Fisheries and Aquatic Resources) and Norway (the Institute of Agriculture Research-Akvaforsk). The base population was

established by combining fish from Egypt, Ghana, Senegal, Kenya and four local strains in the Philippines. After six (6) generations of selection, the growth of GIFT strain had improved by more than 80% as compared to the base populations (Nguyen *et al.*, 2010). GIFT had been reported to perform well in the Malaysian culture systems (ponds and cages). An average of 11% genetic gain per generation was achieved (Azhar *et al.*, 2014).

With all these good traits of GIFT, DoF had targeted an annual production of 60,000 MT/year by 2020. However, this plan would not materialize if the consumers preferred red over black tilapia (including GIFT). The preferences of red over black tilapia has been reported previously by (Ang *et al.*, 1989; Mazuki, 2015). Thus to promote GIFT production, coordination between DoF, farmers and the consumers is required.

Is demand for GIFT really lacking? Little is known on consumer attitude or perception on freshwater fish, including GIFT in Malaysia. In order to address this question, understanding consumer awareness and acceptance of GIFT could help in forming the basis of decisions related to production and developing marketing strategies for GIFT. This had been demonstrated by Skuras and Vakrou (2002) for other food products. Knowing consumer preferences are pertinent because information on fish consumption and preferences may enhance the development of fish products geared towards meeting their specific demands or desires (Quagraine, 2006). Therefore, a survey was conducted during MAHA 2016. MAHA stands for Malaysia Agriculture, Horticulture and Agrotourism, a biennial event held for duration of 10 days in Serdang, Selangor, Malaysia. It is the leading agricultural show of its kind in Malaysia. MAHA was chosen as it offered best opportunities to obtain feedback from various levels of the society who visited this exhibition. The main objectives of the survey were to assess consumer awareness and to evaluate their acceptance of GIFT.

## **Materials and Methods**

### *Awareness survey*

The primary purpose of the survey was to assess the level of awareness of GIFT among the MAHA patrons. A face to face survey was conducted on randomly selected individuals from different socio-economic backgrounds. A total of 152 individuals agreed to participate in the survey within 3 days. The questionnaire consisted of 11 questions which were divided into 2 sections. The first section focused on interviewee profile which included questions pertaining to the standard demographic variables such as age, gender, race, occupation and whether they consume fish. The second section dwelt on their knowledge on GIFT, how they came across this fish, availability in the market, price, and whether they liked the taste of this fish.

### *Acceptance Test*

#### *GIFT Tilapia preparation*

The acceptance test or also known as the affective analysis, preference tests or hedonic tests, are used to quantify consumer preferences or degree of liking/disliking of a product (Lawless and Claassen, 1993). The purpose of this test was to evaluate the personal response on the preference or acceptance of the current or potential customers concerning a product idea, an existing product or some specific product characteristics (Meilgaard *et al.*, 2007). An acceptance test was carried out on 99 individuals (N = 99). A freshly prepared steamed (with no added flavor/color) GIFT tilapia fillet (1.5 x 1.5 inches) was served on a small plastic plate with a spoon and each participant was provided with a napkin and water. Each participant could eat the whole portion or only the necessary to determine their general acceptance of the product. Participants were asked to evaluate the fish and mark the level of acceptance on a 7-point hedonic scale. In the test, participants were asked to give their hedonic opinion to a product sample by choosing and marking one of the seven alternatives,

(ranging from 1= extremely like to 7 = extremely dislike). The person had to mark on the scale for taste, odour, texture and appearance attributes that would best fit their perception of the product.

### *Statistical analysis*

Data collected from the survey was entered and analyzed using the Statistical Package for the Social Sciences (IBM-SPSS Inc. version 20.0). Descriptive analysis was done based on the means, standard deviation, percentages and frequency distribution of responses.

## **Results and Discussion**

### *Awareness survey*

#### *Socio-economic characteristics of respondents*

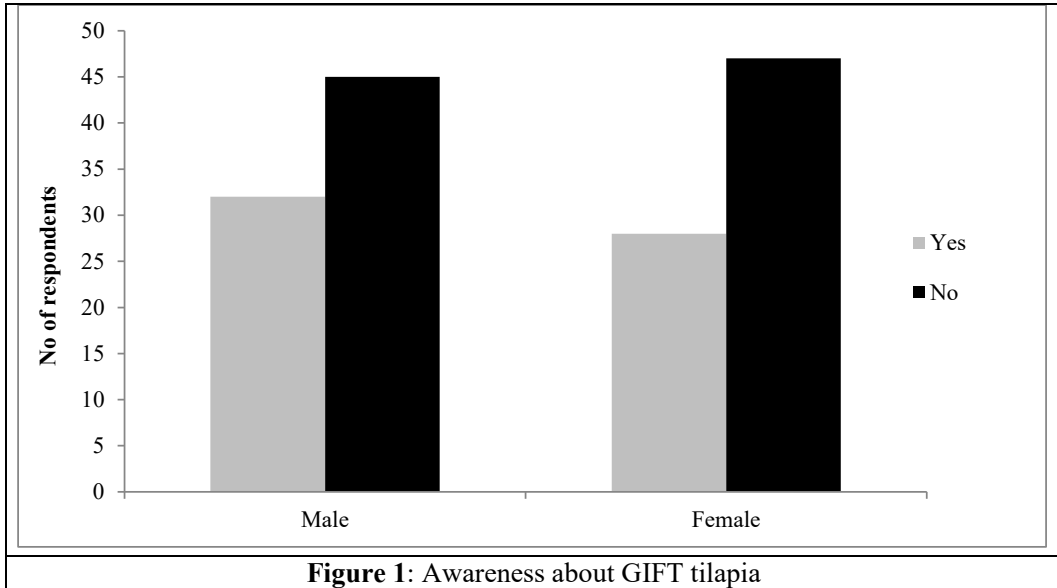
This study gathered preliminary information on the awareness of GIFT among the MAHA patrons. Table 1 summarizes the socio-demographic characteristics of the respondents in this survey. The percentages of male and female respondents were about equal: 50.6% males and 49.4% females. Majority of the respondents were Malays (90%). Almost half of the respondents were below 40 years of age i.e aged between 20-39 years. Most of the respondents were employed in the private sector (27.6%), as government staff (25.6%) or indulged in self-owned business activities (21.0%). Quarter of the respondents is students. Finally, when respondents were asked about their fish preferences, almost all of them consumed fish in their diets. Most of the respondents interviewed had been consuming both marine and freshwater fish in their diets.

**Table 1:** Socio-economic characteristics of the respondents in the awareness survey

<b>Demographics</b>	<b>Category</b>	<b>Number (Percentage)</b>
1. Gender	Male	77 (50.65%)
	Female	75 (49.35%)
2. Age	>50 years	25 (16.4%)
	40-49 years old	32 (21.0%)
	30-39 years old	39 (25.5%)
	20-29 years old	39 (25.6%)
	<19 years old	17 (11.1%)
3. Race	Malay	138 (90.7%)
	Chinese	11 (7.2%)
	Indian	2 (1.3%)
	Others	1 (0.07%)
4. Occupation	Own Business	32 (21.0%)
	Government	39 (25.6%)
	Private	42 (27.6%)
	Pensioner	1 (0.07%)
	Student	38 (25.0%)
5. Preference of fish type	Marine fish	31 (20.4%)
	Freshwater fish	11 (7.2%)
	Both	110 (72.4%)

### *Awareness on GIFT Tilapia*

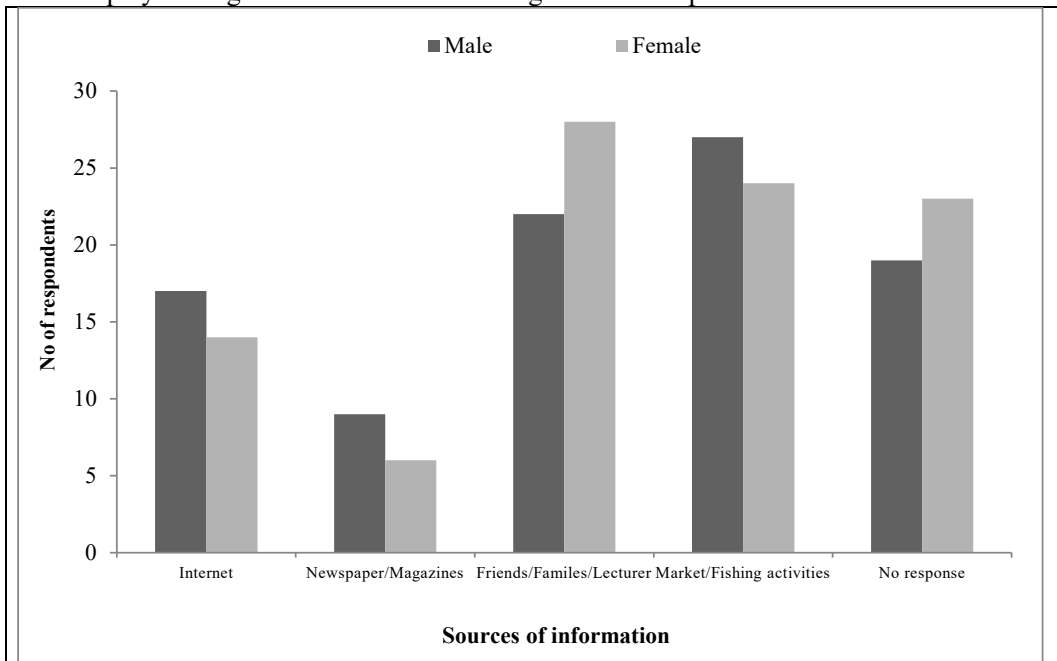
On the whole, more than half (N = 90, 59 %) of the respondents were unaware or oblivious of the name GIFT although they had seen it at the wet markets, night markets, *pasar tani* and hypermarkets before or had encountered fish similar to GIFT from their recreational fishing activities at ponds, lakes, drains or rivers. The respondents were also unaware of the collaborative project between DoF and WorldFish that produced this fish. However, about 33 % (60) were familiar with GIFT. However, they claimed unable to distinguish GIFT from the black tilapia (Nile tilapia).



**Figure 1:** Awareness about GIFT tilapia

*Source of awareness or information on GIFT*

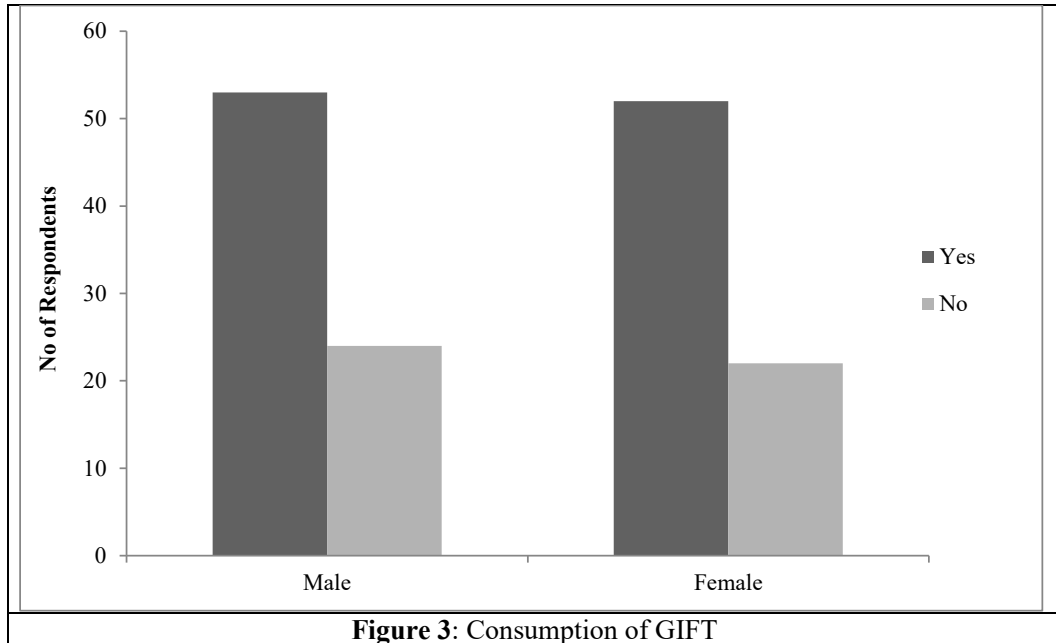
Most of the respondents (N = 51, 33.5 %) recognized GIFT from their hobbies and through observations in the market places. According to these respondents, this fish or similarly looked fish could be obtained from various local aquatic bodies such as ponds, lakes, rivers, streams, canals or drains etc. Although the respondents had seen this fish but not all of them were able to specifically identify the fish as GIFT. About the same percentage of the respondents (N=50, 26.3%) came to know about GIFT through their family members, friends and lecturers during their student days. Media also played a significant role in introducing GIFT to the public.



**Figure 2:** Sources of information regarding GIFT

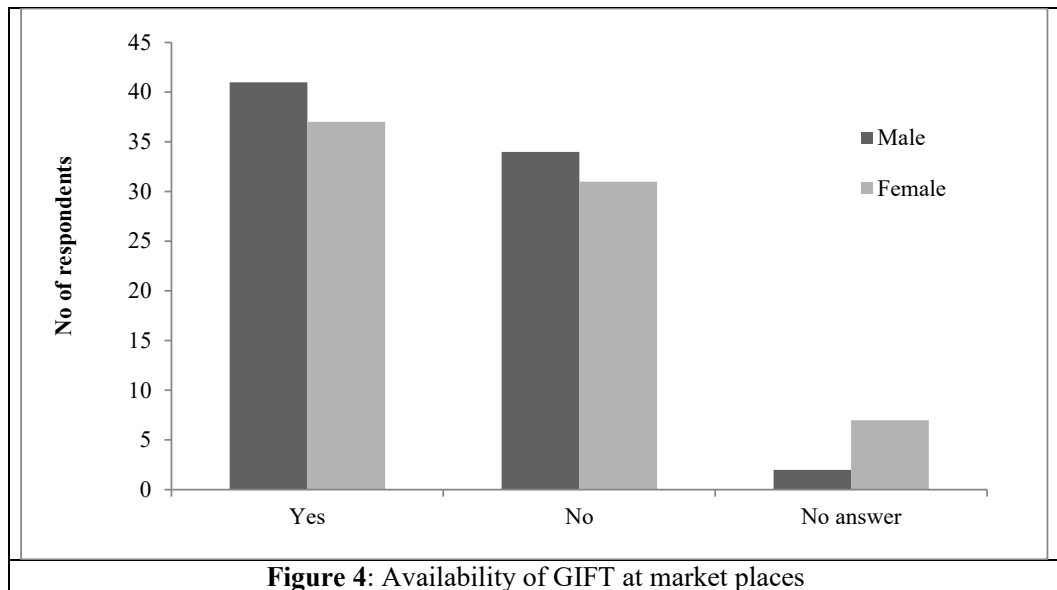
### Consumption of GIFT

Most of the respondents (69.7%, N = 106) claimed that they had eaten GIFT or fish that appeared like GIFT (Figure 3). The respondents could have eaten the fish in other forms such as fillet without knowing that it was GIFT. All respondents (100%) that had experienced eating GIFT liked the fish very much and were not bothered by their appearance which is alleged to be not appealing as compared to the red tilapia. Those who answered no to this question did not favour freshwater fish including tilapia because of the muddy smell and various claims in the social media on the disadvantages of eating Tilapia in general.



### Availability of GIFT

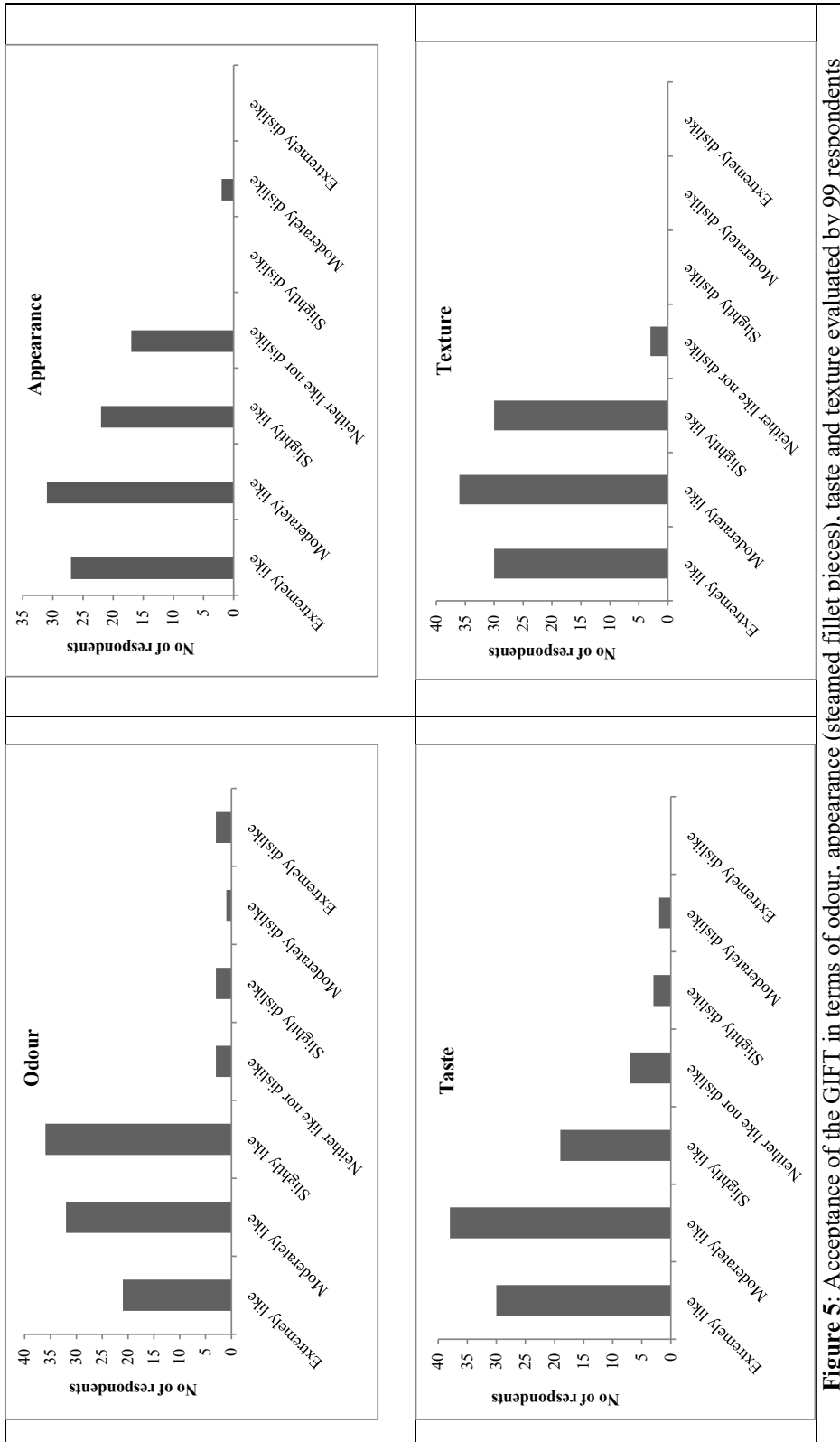
GIFT is commonly sold as whole fresh fish and sometimes live at the wet markets. It is also traded in the form of fillet at the supermarket or hypermarket. Slightly more than half of the respondents (57.2%) claimed that GIFT was not widely traded and could only be bought at certain day or wet markets and hypermarkets (Figure 4). Although not widely available, a total of 61.8% (N = 94) respondents stated that the price of the GIFT was reasonable and worth buying. The price ranged from RM 10.00 to 16.00/kg depending on the size. The respondents had no problem buying GIFT if it was readily available and sold at a reasonable price.



**Figure 4:** Availability of GIFT at market places

*GIFT Acceptance test*

According to Lawless and Heymann (2010), a sample size of around 75-150 individuals is adequate when performing the acceptance test. In this test, 99 individuals participated to evaluate the GIFT. Although the 9-point degree of liking scale, also called the 9-point hedonic scale, is probably the most commonly used (Tuorila, 2008, Lawless and Heymann, 2010), we used the 7-point liking scale to quantify consumer perception of GIFT. This was because the 7-point scale is more suitable for the Malaysian as recommended by Aminah (2000).



**Figure 5.** Acceptance of the GIFT in terms of odour, appearance (steamed fillet pieces), taste and texture evaluated by 99 respondents

Figure 5 illustrates the results of the acceptance test for 4 attributes of the GIFT i.e odour, appearance, taste and texture. Generally, more than 80% of the consumers who participated in the test liked all the attributes of GIFT at various levels. The attributes which had the most “extremely like” percentage was taste (N = 30, 30%) and texture (N = 30, 30%) followed by appearance (N = 27, 27%) and lastly odor (N = 21, 21%). Appearance here refers to the white colored flesh of the steamed GIFT that was served and not the appearance of the whole fish with skin. The texture of GIFT was among the attributes most liked by the participants. According to them, the flesh was flaky, well segmented and soft. However, the flesh was not as soft and mushy as that of red tilapia. These attributes made GIFT a better option for grilling as the flesh will not be easily stuck onto the iron grill.

Although the acceptance of GIFT (whole and raw) was not determined in the acceptance test, the participants were presented with fresh whole GIFT tilapia. Almost all participants had no issues with the appearance of the fish. The physical morphology appeared almost the same for the red tilapia and GIFT. The only setback for GIFT was the greenish grey color. Although the Chinese consumers have a preference for red tilapia especially during their New Year celebration as it signifies prosperity, the Malay consumers on the other hand have no overly preference for red colour. According to them, they bought red tilapia because they were more readily available in the market and were familiar with the fish. Their involvement in this test had made it possible to change the perception of many participants whom all this while had never eaten or disliked freshwater fish in general.

The odour was the least favored attribute (21%) and the highest “non-like” percentage (7%) among the attributes tested. This may be due to the slight muddy smell which is generally associated with freshwater fish including tilapia. As the GIFT was freshly harvested from the Jitra Aquaculture Extension Centre a few days earlier, the earthy smell could have been still strong. It should be emphasized that GIFT served to the participants’ in this survey was simply cooked without any additional seasoning. Thus, the pure taste and smell of the fish would have surely been prominent. However, if the fish had been cooked with seasoning or herbs as in normal cooking method, the earthy smell might have been more tolerable. In addition the muddy smell could have been eliminated or reduced through purging process as practiced by the farmers.

Some of the consumers generally avoided buying and consuming black Tilapia (possibly including GIFT) because they were apprehensive as to whether it was being harvested from sewage treatment ponds, although this had not been the common practice. Muslim consumers in particular avoided eating tilapia due to reports in the media that tilapia were being fed with unhygienic or even forbidden (*haram*) substances such as chicken offal, animal carcasses, wastes from animal farm (The Star, Jan 18<sup>th</sup>, 2015; Berita Harian and the New Straits Times, Mar 10<sup>th</sup> 2017) or commercial feed incorporated with animal derivatives (bone meal, blood meal, feather meal).

The vital information obtained from this survey suggests that GIFT is not very well known to the public. Thus there is a need for more active promotion on GIFT for the consumers and farmers. Firstly there is a need for handouts/pamphlets with basic information on GIFT and the Jitra center as the producer of GIFT to be distributed. Secondly, a documentary on GIFT in collaboration with the national or private TV channels could also be arranged to air and promote GIFT. Thirdly, the launching of Kubang Pasu district in Kedah, Malaysia as MyGIFT Valley would further help promote GIFT since this is where the Jitra center is located. Last but not least, DoF can encourage the traders especially the supermarkets and hypermarkets to label GIFT as such in order to bring identification and to create awareness among consumers.



## Conclusion

Basically more than half of the respondents (62.5%) were not aware of the existence of GIFT. Over 80% of the participants in the acceptance test liked the attributes (taste, texture, odour and appearance) of GIFT. Thus, there is a need for more active promotion of GIFT among consumers and farmers.

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