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A Study on The Level of Farmer Knowledge, Attitude and Practices on The *Litopenaeus Vannamei* Disease in Pond Culture

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Abstract: *Litopenaeus Vannamei* is a high-value commodity shrimp species in the aquaculture sector, especially Asia. Unfortunately, disease attack is a problem that emerges from shrimp aquaculture to gain high profit. Among the common disease that usually infects *L. Vannamei* are white spot disease (WSD) and Fusarium bacteria which causes black gill disease. This problem arises from farmers' lack of knowledge about shrimp disease, low management attitude and poor aquaculture management practices. Therefore, this research objective is to investigate a farmer's level of knowledge, attitude, and practices on the *Litopenaeus Vannamei* shrimp disease. The research method used in this study is a quantitative method (questionnaire survey) using a google form and the questionnaire was distributed online. The respondents were chosen from the *L. Vannamei* farmers (50 respondents) in Kota Bharu, Kelantan. The survey was open for one month between 15th November and 15th December 2021. The data was analysed using IBM SPPS software version 24.0 to obtain the frequency, percentage and descriptive analysis to analyse the level of knowledge, attitude and practices of *L. Vannamei* farmers on the shrimp disease in pond culture. This study showed that the level of knowledge, attitude, and practices of *L. Vannamei* farmers on the shrimp disease in pond culture is high, as can be seen by the good attitude in *L. Vannamei* management and having good aquaculture management practices. In conclusion, the high level of knowledge, attitude and practices of *L. Vannamei* farmers helps to motivate farmers to apply good management on shrimp cultivation to prevent the disease and increase the production of high-quality seeds.

Keywords: Aquaculture, knowledge, attitude, practices and *Litopenaeus Vannamei*

1. Introduction

Shrimp is one of the country's most popular trading shellfish, with over 3.4 million tonnes sold annually at wholesale rates ranging from $3800 to $8800 USD per tonne (FAO, 2018). As the world's population continues to grow, shrimp production may quadruple in the next 20 years to meet future demands (Tidwell, 2012). Aquaculture has emerged as the most realistic solution to meet present and future shrimp market requirements (Tidwell, 2012) since wild harvest capture has remained flat (Gillett, 2008). However, shrimp diseases are the shrimp cultivating industry's greatest concern. In Asia, the impact of diseases cost the shrimp business billions of dollars every year (Shinn et al., 2018). There are various diseases that cause this monetary misfortune. Factors such as the absence of farm management practices, biosecurity and knowledge towards shrimp health management. No single infection of shrimps can be definitively named the most severe, as this depends on the circumstance, the timing of the outbreak and the season. Some of the most common shrimp diseases found in Asia are *acute hepatopancreatic necrosis disease* (AHPND), which is caused by bacteria; *white-spot syndrome*

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virus (WSSV), which is caused by virus; and *Enterocytozoon hepatopenaei* (EHP), the fungal microsporidian (Le, 2020). In order to implement good farm management, the farmer or aquaculturist must have good knowledge, attitude and practices toward the shrimp disease. Therefore, this study aims to investigate the level of farmer's knowledge, attitude and practices of the white shrimp disease.

1.1 Types Disease of *Litopenaeus Vannamei*

White Spot Syndrome Virus (WSSV), the infection of the virus of penaeid shrimp, causes *white spot disease* (WSD). Shrimp farming is decreasing due to infectious diseases such as parasite and fungal produced by bacterial and viral infections (Primavera, 1998). The causative infection is presently known as white spot syndrome infection (WSSV), based on the symptomatic nearness of pinpoint to 1-mm whitish spots on the fingernail skin of a few contaminated people. It also can cause 100% mortality of shrimp within 3–10 days of clinical symptoms (Witteveldt et al., 2004; Alifuddin et al., 2003). Typically, white patches 0.5–2.0 mm in diameter on the skin of the fingernail, most visible inside the carapace. The physical signs of shrimp infected with white spot disease are as follows tired, stop eating, swim near the surface or edge of the pool and the cuticle becomes loose with white spots measuring 0.5 to 2.0 mm in diameter inside of the carapace (Department of Fisheries, 2021).

Black gill illness has been linked to chemical contaminants such as oil, cadmium, copper, zinc, potassium permanganate, ozone, ammonia, nitrate, ascorbic acid deficiency, heavy siltation, high organic load from residual feed, debris, and faeces on the pond bottom (Superio et al., 2019). In shrimps, the gill is the most vital organ for breathing. Infection of the gills with fungi can kill shrimps by blocking breathing, increasing chronic mortality, and making shrimps more susceptible to other diseases (Rhoobunjongde, 1991).

The Fusarium bacteria causes black gill disease in penaeid shrimp. Several bacteria have been implicated as causes of disease and mortality in cultured penaeids, especially in the larval, post larval and juvenile stages (Johnson, 1983). When the gills infected with bacteria, it will cause death to occur. This is because it will block breathing and other diseases will also appear. The most apparent symptom bacteria infect a shrimp is a change in the colour of the gills. The gills appear opaque white to yellow or brown in the early stages and eventually turn black (Rhoobunjongde, 1991). In the early stage of infection, the gills of shrimp turn orange-yellow or light brown. In the end, the gills turning darker until they are in deep black colour (Sindermann,1974). This disease can cause massive mortalities but not as significant in some others disease.

WFD (white faeces disease) is a new disease affecting vannamei shrimp (Litopenaeus vannamei). WFD symptoms included pale hepatopancreas discolouration and white faeces floating on the water pond surface (Somboon et al., 2012), as well as intestinal discoloration that turned white (Rajendran et al., 2016; Somboon et al., 2012). Malaysia, Thailand, Vietnam, China, and India have all recorded cases of WFD (Durai et al., 2015; Cao et al., 2015; Mastan, 2015; Somboon et al., 2012; Inthusai, 2006).

Early mortality syndrome (EMS) or acute hepatopancreatic necrosis syndrome (AHPNS) appeared to be affecting the shrimp aquaculture sector in Asia. Prof. Donald V. Lighter and his team at the University of Arizona's Aquaculture Pathology Laboratory (APL/UAZ) reported the first occurrence of EMS/AHPNS in southern China and Hainan Island in 2010, followed by Viet Nam and Malaysia in 2011(Lightner, 2011). Slow growth, corkscrew swimming, loose shells, pale colour, and an empty or interrupted gut are only a few of the clinical indications. Infected shrimps also have a hepatopancreas that is aberrant (shrunken, tiny, bloated, discoloured, or black) (Zorriehzahra & Banaederakhshan, 2015).

1.2 Model (Kap)

This model has three main elements namely knowledge, attitudes, practices, and behaviors and are fundamental to the formation of the KAP model. This KAP Study specifically information about what the selected shrimp farmer knows about shrimp disease, how they feel about it and react or behave towards the shrimp disease (Figure 1).

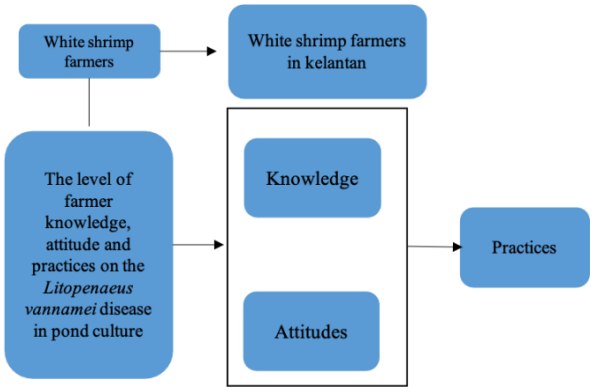

Fig. 1: Conceptual framework adaptation from (Ramsey and Rickson, 1976)

2. Methodology

2.1 Research Design

The study uses a survey study form to identify, analyze, and study the relationship between farmer knowledge, attitude and practices on the shrimp disease (*Litopenaeus Vannamei*) in pond. The researcher chose this study form because it is the most appropriate for responding to the study's aim and objectives. Definition of survey research is the methods used to conduct research using surveys sent to survey respondents by researchers to represent the entire sample.

2.2 Population and Sample

The total population of the study is *L. vannamei* farmers in Peninsular Malaysia which is approximately 438 people (Department of Fisheries, 2018). Any number of characteristics within a group that statisticians use to draw conclusions about the subjects in a study can be defined as population (Gustafson & Branch, 2002). Apart from that, a population is a total number from which a statistical sample is drawn which may refer to an entire group of people, objects, events or measurements. Therefore, sample is referring to a smaller, manageable version of a larger group (population) which has the characteristics of a larger population. Thus, sample refers to a smaller, more manageable version of a larger group (population) that shares the characteristics of the larger population. Thus, a sample of 201 farmers was selected as the respondents but due to the pandemic Covid-19 a few areas ware selected to conduct this survey which are Kota Baharu, Kelantan.

2.3 Research Instrument

A research instrument is a method to collect data used in the study to acquire the study's purpose. The main of this research is to be analysed using a quantitative method. Rather than limiting the number of samples, the researcher has chosen to spread the questionnaire over for a month. The researcher's primary instrument in this research is an online questionnaire. The online survey questionnaire was divided into section A, section B, section C, and section D. Section A is respondents' demographic information. Section B includes items to measure farmers' knowledge of the shrimp disease. Section C is included items to measure the level of farmers attitude on the shrimp disease. Section D is included items to measure the level of farmers practices on the shrimp disease in pond culture (Table 1). This research will be using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 1: Section in questionnaire

Section	Item
A	Demographic information
B	The level of farmer knowledge on the *Litopenaeus Vannamei shrimp* disease in pond culture.
C	The level of farmer attitude on the *Litopenaeus Vannamei* shrimp disease in pond culture
D	The level of farmer practices on the *Litopenaeus Vannamei* shrimp disease in pond culture

2.4 Data Analysis

The IBM SPSS Statistics 24 was utilized by conducting descriptive analysis to obtain statistics including mean, standard deviation, frequency, and percentage to summarize the data. Internal consistency of each identified construct was calculated to evaluate instrument reliability through Cronbach's alpha values.

3. Results and Discussion

3.1 Demographic of Respondent

The majority of respondents (54.0%) were between the ages of 25 and 29. The age groups of 30-34 years and 35-39 years were followed by respondents (18.0 percent). While, respondents 6.0% were followed between the ages 40-44 years and 4.0 percent for the age groups of 45-50 years. The majority of respondents 41 respondents (82.0%) were male and only 9 (18.0%) were female. A total of 24 people (48.0%) were single. Married respondents account for 26 (52.0%) of the total. The majority of respondents are from Diploma, which is 27 (54.0%). Followed by respondents from Degree 15 (30.0%), PMR/SPM/STPM three (6.0%) and others five (10%). A total of 14 respondents (27.5%) are farmers who use earth ponds as a culture system, 11 respondents (21.6%) others, 10 respondents (19.6) hatchery, 9 respondents (17.6%) PVC, 4 respondents (7.8%) cement pond and two respondents (3.9%) cage (Table 2).

Table 2: Demographic respondents

Variable	Category	Frequency	%
Age (Old)	25-29	27	54.0
	30-34	9	18.0
	35-39	9	18.0
	40-44	3	6.0
Gender	45-50	2	4.0
	Male	41	82.0
Marital status	Female	9	18.0
	Single	24	48.0
Level of education	Married	26	52.0
	Diploma	27	54.0
	Degree	15	30.0
	PMR/SPM/STPM	3	6.0
Culture system	Others	5	10.0
	Earth pond	14	27.5
	Others	11	21.6
	Hatchery	10	19.6
	PVC	9	17.6
	Cement pond	4	7.8
	Cage	2	3.9

3.2 The Level of Farmer Knowledge on The *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

The study results have proven that the level of farmer knowledge on the *Litopenaeus Vannamei* shrimp disease in pond culture is high, 4.68 (Table 3). Shrimp farmers are experiencing initiatives need based on technology developed by their knowledge (Chowdhury & Khairun, 2014). Farmer should have this knowledge as prevent their farm from disease attacks that will cause immortality and lose on their profit. Other than that, this knowledge also helps farmers build high-quality white shrimp. Furthermore, without this knowledge, farmers cannot run this farm according to the Fish Department regulation as on the act they already have. The findings of this study can help relevant organizations perform or support white shrimp raising knowledge, such as proper research management approaches for shrimp farmers, so that farmers can better understand and handle problems that arise more effectively and sustainably. The findings can help farmers have a better understanding of how farmers behave when it comes to conservation (Ashoori et al., 2016).

Table 3: Means and standard deviations level of farmer knowledge on *the Litopenaeus Vannamei* shrimp disease in pond culture

Item	Mean	SD
I know this white shrimp disease can cause immortality.	4.68	.513
I can identify the symptoms of white shrimp disease.	4.30	.707
I found out about white shrimp disease through print and electronic.	4.02	1.020
I have knowledge of proper waste management which can prevent shrimp from getting this disease.	4.44	.611
I know how to control or treat this disease.	4.32	.891
I know white shrimp will be attacked by different types of diseases at different ages (Example: *Necrosis* and parasitic infections).	4.24	.960
I got exposure about this white shrimp disease from a program made by the company.	3.68	1.151
I can differentiate the types of white shrimp diseases such as *Necrosis, EHP, White Spot, Black gill* and parasitic infections.	4.14	.904
I think that weather (rainy season) is one of the contributing factors to white shrimp disease.	4.16	.912
I have experience of white shrimp disease attacks on my livestock system.	4.44	1.013

3.3 The Level of Farmer Attitude on The *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

The farmer attitude on the *L. Vannamei* shrimp disease in pond culture is high. This is because farmer attitude has accumulated an overall mean value of 4.86 (Table 4). Therefore, all this can be used as an indicator to study one's attitude

in performing an action. A good attitude from the farmer will help their farm grow advanced and make their shrimp have good quality. Besides, the environment will be more maintained and also the good attitude can preserve aquatic life from the farmer. In this sense, understanding the criteria that interfere with people's attitudes and behaviors in the exploitation of resources in the marine environment can contribute to the effectiveness of the management measures (Tonin & Lucaroni, 2017; Hoehn & Thapa, 2009).

Table 4: Means and standard deviations level of farmer attitude on *the Litopenaeus Vannamei* shrimp disease in pond culture

Item	Mean	SD
I do not throw diseased shrimp into open channels.	4.68	.794
I burn or buried affected dead shrimp.	3.44	1.487
I reported an attack of the disease to the Department of Fisheries.	3.68	.978
I quarantined a pond of diseased shrimp in a different place.	4.46	1.073
I do not sell diseased shrimp.	4.48	1.074
I ensure the health quality of shrimp at the best level.	4.86	.351
I am responsible for controlling the environment of the livestock system from pathogens and pests.	4.78	.465
I treat sick shrimp.	4.54	.930
I act early in dealing with diseased shrimp.	4.68	.653
I made a note on the diseased shrimp to find out the cause of the disease.	4.54	.813

3.4 The Level of Farmer Practices on The *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

The findings of the study show that farmers have a good level of practices of the *L. Vannamei* shrimp disease in pond culture gave a score of 4.88 for the overall mean value (Table 5). In the farm, good practices from farmer will make farm's area environment protected from pest and especially from disease. Finally, as Brock (1997) points out, certain environmental conditions can help the viruses propagate organically. When infected shrimp die or are about to die, they float to the surface of the pond or tank, where bird will freely feed on them if there is no net over the water (Brock, 1997). When the birds leave the farm, they can spread the virus to other farms or wild shrimp populations (Brock, 1997). Equally important disease should not be existed into the farm as the farmer bring and do good practices.

Table 5: Means and standard deviations level of farmer practices on *the Litopenaeus Vannamei* shrimp disease in pond culture

Item	Mean	SD
I manage water quality to with correct procedures.	4.74	.487
I control the feeding of shrimp to prevent increased ammonia content and prevent algae bloom.	4.78	.418
I use equipment that has been sanitized.	4.44	.760
I check the shrimp hepatopancreas regularly to find out the percentage of lipid content and the presence of *Enterocytozoon Hepatopenaei* (EHP).	4.12	.918
I taking water sample on a daily basis.	4.44	.644
I ensure the water quality follow the standard.	4.76	.517
I install a net or roof on top of culture's pond to avoid from pests.	4.64	.802
I treat the water before use on culture pond.	4.88	.328
I ensure the farm environment is in good condition and clean.	4.74	.487
I daily checking on shrimp's behaviour especially during it active (at night).	4.44	.705

3.5 Relationship Between Farmers' Knowledge and Farmers' Practices on *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

A correlation test was used to see the relationship between farmers' knowledge and farmers' practices on *L. Vannamei* shrimp disease in pond culture. The study results show a positive relationship between farmers' knowledge and practices on *L. Vannamei* shrimp disease in pond culture ($r = .566$, $n = 50$, $p = .000$; Figure 2). When farmers have knowledge about white shrimp disease, then when they are faced with the situation, they can overcome the problem by applying the knowledge they have. This can indirectly, reduce shrimp mortality caused by deck disease due to the initial action taken by farmers. According to Notoadmodjo's (2012) theory, which states that the level of knowledge can make a person aware

so that someone will behave according to the knowledge possessed, the level of knowledge of a person affects a person's actions in carrying out a decision or action to be taken.

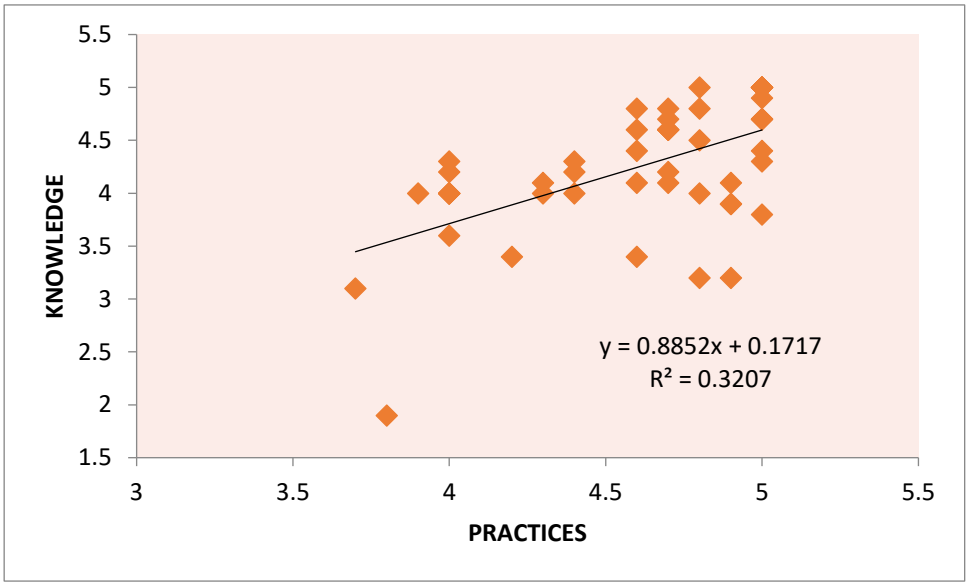

Fig. 2: Correlation between knowledge and practices

3.6 Relationship Between Farmers' Knowledge and Farmers' Attitude on *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

A correlation test was used to see the relationship between farmers' knowledge and farmers' attitude on *L. Vannamei* shrimp disease in pond culture. The study results show a positive relationship between farmers' knowledge and attitude on *L. Vannamei* shrimp disease in pond culture (r = .673, n = 50, p = .000; Figure 3). According to Siltrakool (2018) theory, which states that attitude is a person's tendency to act where the actions taken by a person are a reaction that describes the knowledge and attitudes they have. This means that there is a difference between farmers' attitude and farmers' attitude on *L. Vannamei* shrimp disease in pond culture. According to Notoadmodjo's (2012) theory, which states that a person's good or positive attitude is influenced by good knowledge, the better the knowledge a person has, the better a person's attitude will be.

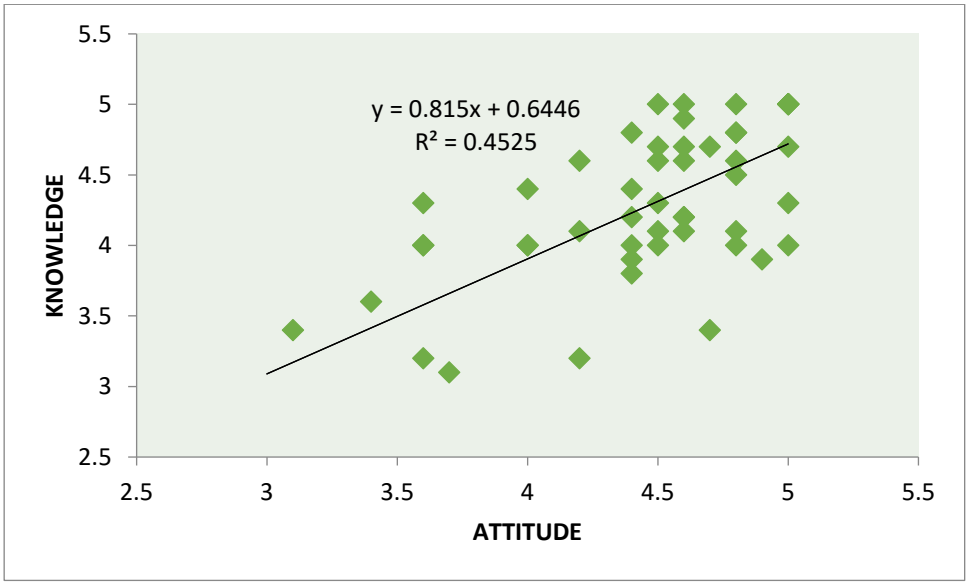

Fig. 3: Correlation between knowledge and attitude

3.7 Relationship Between Farmers' Practices and Farmers' Attitude on *Litopenaeus Vannamei* Shrimp Disease in Pond Culture

To identify the relationship between practices farmer's and attitude farmers on *L. Vannamei* shrimp disease in pond culture, researchers have used Correlation Test. The test results show that there is significant and positive relationship between farmers' practices and farmers' attitude on *L. Vannamei* shrimp disease in pond culture (r = .582, n = 50, p = .000; Figure 4). When the attitude of the farmer is good indirectly the practice of the management of the farmer will also be good. According to Madanat, Mishalani, & Ibrahim (1995), in some cases, attitude represents the outcomes of producing reactions in various ways, and it observes and explains the outcome of the reaction, or it combines several points of view into one. The attitude of the farmer influences the management of the farmer's practice such as farmers are unaccustomed to and untrained to take water quality tests, which are routinely taken in closed pond systems (Boyd & Tucker, 2012) or in shrimp culture.

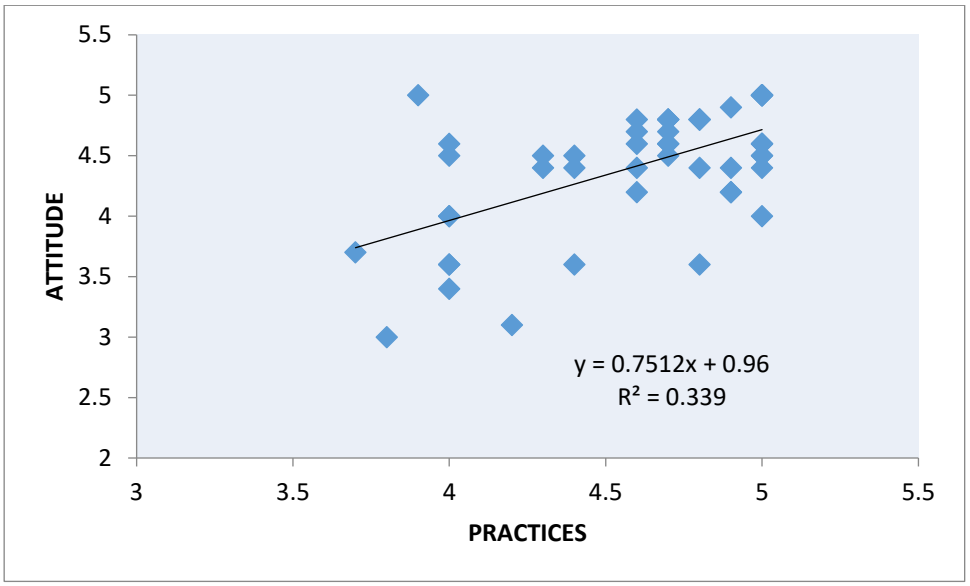

Fig. 4: Correlation between practices and attitude

As a result, some recommendations for subsequent research will include a variety of topics, including the research population and sample. Maybe, the researcher can involve white shrimp farmers in one district and throughout Malaysia to get better results. Besides than that, perhaps after this, the researcher can add another objective to study and analyze the types of shrimp diseases that are often attacked to white shrimp and the way farmers deal with such shrimp diseases.

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