

CHAPTER I. INTRODUCTION

I.1. Background

Fish farming especially koi fish is more popular recently because this type of fish is an ornamental aquatic pet which exhibits beautiful color, live in fresh water, and could live in wide temperature range. The koi fish food is usually carefully formulated with a well-balanced supply of key nutrients to ensure healthy growth and good conditions with minimal waste production. The key nutrients include proteins (amino acids), carbohydrates, lipids (fatty acids), vitamins (C, B, A, D, E, K), and minerals (calcium, phosphorous, magnesium, iron, manganese, etc.) (D.F. Manurung, 2014)

Koi fish is considered as ammonia factory because during its metabolism, the fish produce large amount of ammonia which is directly related to the amount of food given each day. Ammonia is produced from several ways; [1] respiration through the gills, [2] digestion through urine and feces, [3] decomposition of uneaten food, and [4] decomposition of sediment such as plant materials and other dead organisms in water (A. John, 2004). The concentration of ammonia in water must be controlled carefully because of its toxicity to koi fish that may cause stress and damages gills and other tissue, even in small concentration. Its mechanism includes blocking the oxygen transfer from the gills to the blood and may cause both immediate and long term gill damage. In addition, the mucous producing membranes can be destroyed and thus, reducing the external slime coat and damaging the internal intestinal surfaces. Prolonged exposure with ammonia decreases the fish resistance to bacterial infections and growth. Therefore, ammonia contamination on fish pond is a serious problem and removal of ammonia from the water is necessary. The presence

of bacteria in water such as nitrifying bacteria will convert ammonia to nitrite and nitrate through oxidation reaction. Compared to ammonia, nitrite and nitrate have less toxicity level and thus, greater concern has been given to remove ammonia from the water.

In addition to ammonia, nitrite, and nitrate in water, other nutrients such as phosphorus, sulfur, potassium, iron, zinc, calcium, magnesium, molybdenum, etc are also released in the water. The availability of those nutrients has been utilized to grow plants in a system called aquaponics. Basically, plant nutrients are categorized into three main groups. Firstly, nutrients of nitrogen, phosphorus, potassium, and manganese are actively absorbed by plant roots. Secondly, nutrients that are more slowly absorb are zinc and molybdenum. Thirdly, sodium is taken passively by plants and tended to accumulate in the system compared to others. Identification concentration of nutrients in water can be further used as a tool to assess the productivity of the system. Since the concentration of nutrients depends on the feeding rate, thus determination of the optimum feeding rate is one of important parameters to optimize conditions required in fish farming.

Adsorption method is another approach to remove ammonia from water. In this study, zeolite has been selected as adsorbent since it has been reported as the best adsorbent to remove ammonia in aquaculture system. In order to increase the adsorbent performance, activation of the adsorbent is generally performed that can be achieved by two different methods, i.e. physical and chemical treatment. The latter treatment becomes focus in this study. More specifically, chemical activation using inorganic salts, in this study using NaCl, has been selected to modify the raw zeolite.

I.2. Objectives

1. To study the effect of fish food addition on total ammonia nitrogen in the koi fish pond.
2. To study the effect of NaCl addition during zeolite modification on total ammonia nitrogen in the koi fish pond.
3. To study the effect of combination of fish food addition and zeolite modification on Total Ammonia Nitrogen by using MANOVA.

I.3. Problem Limitation

1. Zeolite used will be obtained from Ponorogo
2. Nitrogen analysis using SERA Ammonia Test
3. Type of fish food : C.P.TM Koi Super Growth