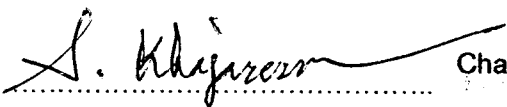
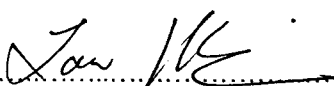


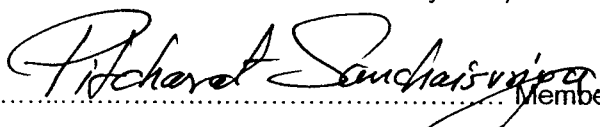
THESIS TITLE :        A STUDY ON THE USE OF DUCKWEEDS (*Lemna* spp.) FOR  
THE IMPROVEMENT OF THE NUTRITIVE VALUE OF  
CASSAVA CHIP IN STARTING PIG DIETS.

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#### ABSTRACT

A study was conducted to investigate whether the dried duckweed (*Lemna* spp.) could be used to improve the nutritive value of cassava chip in starting pig diets. The study was divided into three experiments. The first experiment was to determine the optimal condition for duckweed production. The second and third experiments were to evaluate the effects of incorporating duckweed into cassava – based starting pig diets, with or without amino acids (lysine and methionine) supplementation, on growth performance and nutrient digestibility of starting pig , respectively.

In experiment 1, the study was subdivided into two trials. The first trial was to preliminarily investigate the growing behaviour of duckweed in natural ponds. The second trial was to study the effects of kinds of fertilizer and rates of application on dry matter (DM) yield and nutritional composition of duckweed cultured in the experimental tanks. It was observed that duckweed grew rapidly in natural ponds if the ponds had optimal conditions in terms of pH, amount of dissolved organic matter and water contained high enough plant nutrients and was not disturbed by unfavourable environmental factors, such as too intense sunlight, too strong wind, too shallow water

or being infested by disease or insects. After removal of duckweed by a half of the pond surface area it could re-grow and cover the water surface within 3 to 5 days. In the experimental tank condition, duckweed was cultured in tanks containing 300 litres of water with four inclusion rates (5, 6, 7 and 8 litres/day) of added pre-fermented swine or layer manure in a 2 x 4 Factorial in Completely Randomized Design (CRD) trial. The trial was conducted in three consecutive 30-days periods to test the effects of each of three manure concentrations (3, 6 or 9 kilograms in 300 litres of water) on performance of duckweed. The manure was pre-fermented for 7 days before being added to the culturing tanks. The test criteria were dry matter yield and proximate composition of the cultured duckweed. It was observed that dry matter yield of the cultured duckweed was significantly affected ( $P<0.01$ ) by both sources and inclusion rate of manure. Layer manure gave higher ( $P<0.01$ ) duckweed yield than pig manure and the dry matter yield quadratically increased ( $P<0.01$ ) by the increasing rates of manure inclusion with the maximum yield at 7 litres/day. Also, the dry matter yield of duckweed linearly increased ( $P<0.01$ ) with manure concentration. Proximate composition of the cultured duckweed (e.g. CP, ASH, P, etc.) was significantly increased ( $P<0.01$ ) as the concentration of fermented manure increased from 3 to 9 kg/300 litres of water. However, there was no definite trend of the proximate composition of duckweed grown in water with different rates of manure inclusion. It was thus concluded that duckweed grew more rapidly and has a higher proximate composition in higher nourished water as compared to that grown in water with less nutrient level.

In second experiment, 48 crossbred pigs (Duroc x Large White x Landrace) comprising of 24 castrated males and 24 females with an average body weight of 15 kg were randomly assigned into 6 dietary treatment groups of 3 x 2 factorial in the Completely Randomized Design experiment. Each group had 4 replications and each replication had 1 castrated male and 1 female. All piglets were previously dewormed and vaccinated against foot and mouth disease and hog cholera. Each group of the piglets was fed diets containing one of the following levels of dry duckweed: 0, 7.5 or 15.0% with or without lysine and methionine supplementation. All piglets were fed ad libitum and had free access to water throughout the experiment. It was observed that average daily gain (ADG) and protein efficiency ratio (PER) of piglets fed diets containing duckweed levels at 0, 7.5 or 15.0% were not significantly different.

However, there was a trend that piglets in 7.5% treatment had the highest ADG and PER. Piglets on the amino acid supplemented diets had higher ( $P<0.05$ ) ADG and PER than those on the non-supplemented ones. For the feed conversion ratios (FCR), piglets on the 7.5% duckweed diets utilized feed more efficiently ( $P<0.05$ ) than the rests. Similarly, pigs on the amino acid supplemented diets had a more efficient ( $P<0.01$ ) FCR than the non-supplemented groups. Feed consumption and protein consumption of piglets were similar across treatment groups. However, feed and protein consumption of piglets at level 7.5% duckweed tended to be higher than the rests and those with amino acid supplementation tended to be higher than the non-supplemented ones.

In third experiment, 24 crossbred (Duroc x Large White x Landrace) castrated male pigs with an average 25 kg initial body weight, were used in a 3 x 2 Factorial in Completely Randomized Design experiment to evaluate the nutrient digestibility of duckweed supplemented diets. They were divided into two groups and each group was randomly assigned to any one of the six dietary treatments used in experiment 2. Therefore, each dietary treatment was replicated 2 times. This trial ended in 8 days. It was observed that digestibility of dry matter and protein of piglets fed diets containing 7.5% were significantly higher ( $P<0.01$ ) than those of piglets in the 0 or 15.0% groups. However, the digestibility of ether extract in the 7.5 and 15.0% groups was comparable and both were significantly higher ( $P<0.01$ ) than that of the 0% level. Digestibility of gross energy, crude fiber and biological value (BV) of protein in all experimental diets were not significantly different. However, there were trends that the piglets fed diets containing 7.5% duckweed had higher digestibility of gross energy, crude fiber and a higher biological value of protein than those at 0 and 15.0%. Piglets on the amino acid supplemented diets tended to have higher digestibility of all nutrients and a higher biological value of protein than the non-supplemented groups.