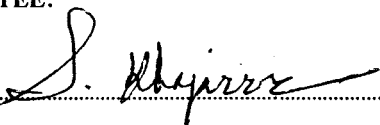
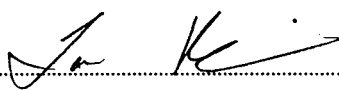



**THESIS TITLE:** A STUDY ON THE SUBSTITUTION OF PALM KERNEL MEAL FOR RICE BRAN IN PIG RATIONS: IMPROVEMENT OF NUTRIENT UTILIZATION BY FAT AND ENZYME ADDITION

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#### ABSTRACT

This series of studies aimed to improve nutrient utilization in pig rations containing palm kernel meal (PKM) as the rice bran (RB) substitute. The studies were subdivided into four experiments. Experiment 1 was to investigate the effects of replacing RB by PKM with vegetable oil on growth performance and carcass characteristics of pigs. Forty-eight cross-bred (Duroc x Large White x Landrace) weanling pigs averaging of 12 kg body weight (B.W.) and balanced sex were used in a 3 x 2 factorial experiment in Completely Randomized Design (CRD). Dietary treatments were the replacing rates of PKM for RB (0, 50 or 100%) in a rice by-products - soybean meal - fish meal - based ration with or without RB oil supplementation. In the practical terms, RB was replaced by PKM at the rates of 0, 5 or 10% in starter (12-30 kg B.W.), 0, 10 or 20% of grower (30-60 kg B.W.) and 0, 15 or 30% of finisher (60-100 kg B.W.) rations. Each treatment was replicated 4 times with 2 pigs (one male and one female) per experimental unit. The experimental pigs were fed ad libitum had a free access to drinking water at all time. It was found that the replacing PKM for RB did not significantly change ( $P>0.05$ ) the average daily gain (ADG), feed consumption (FC) or feed conversion ratio (FCR) of starting and growing pigs. However, with a similar FC ( $P>0.05$ ), the finishing pigs on the 50% replacement group gained weight at the highest rate (0.825 kg/d ADG) which was significantly faster ( $P<0.01$ ) than the 0% (0.799 kg/d) and the 100% (0.714 kg/d) treatments. The FCR for the 0, 50 and 100% replacement groups were significantly different ( $P<0.05$ ) with the values of 2.82, 2.87 and 3.15, respectively. Fat supplementation did not cause any significant changes ( $P>0.05$ ) in ADG, FC or FCR of pigs in starting, growing, finishing or in the overall growing periods. Also there were no significant treatment differences ( $P>0.05$ ) in term of carcass length, backfat thickness or loin eye areas of the finished pigs.

Experiment 2 aimed to evaluate the effects of enzyme (multi-enzyme Kemzyme and enzyme mannanase) supplementation on nutrient digestibility and utilization in PKM-based starting and growing pig rations. Twelve castrated male cross-bred (Duroc x Large White x Landrace) starting (20 kg B.W.) and 12 growing (40 kg B.W.) pigs were used in a Randomized Complete Block Design (RCBD) digestion-metabolism trial with 6 treatments and 2 blocks with 2 sub-samples per block. A RB-based and a PKM-based ration (50% PKM) were supplemented with nil (controls), 0.1% Kemzyme or 0.1% mannanase to yield 6 dietary treatments: RB, RB-K, RB-M, PKM, PKM-K and PKM-M. After 2 one-week test periods for each of the starting and growing pigs, it was found that the starting pigs on the PKM rations had lower ( $P < 0.01$ ) digestible dry matter, protein and energy, but higher ( $P < 0.01$ ) digestible neutral detergent fiber (NDF) and acid detergent fiber (ADF) than those on the RB rations. Enzyme supplementation to both the PKM and RB rations did not help increase digestibility ( $P > 0.05$ ) of dry matter, protein, energy or ADF. The NDF digestibility in the RB rations was not affected ( $P > 0.05$ ) by enzyme supplementation while, Kemzyme, not mannanase, tended to increase of NDF digestibility in the PKM rations. The ME level were equivalent ( $P > 0.05$ ) for all 6 experimental rations. In the growing period, the PKM rations had lower ( $P < 0.01$ ) digestible dry matter, energy and NDF, but higher ( $P < 0.01$ ) digestible ADF and equivalent digestible protein ( $P > 0.05$ ) when compared to the RB rations. Enzyme supplementation did not increase ( $P > 0.05$ ) nutrient digestibility of the RB rations; however, Kemzyme, not mannanase, tended to increase the digestibility of NDF and dry matter of the PKM rations. Also, the ME levels in all 6 growing rations were equivalent ( $P > 0.05$ ).

Experiment 3 was to study the effects of Kemzyme and mannanase supplementation to the PKM-based rations on growth performance of starting (20–30 kg B.W.) pigs. Twenty-four balanced sex cross-bred (Duroc x Large White x Landrace) weanling pigs with the average B.W. of 20 kg were used in a 2 x 3 factorial in CRD experiment. Dietary treatment were various rates of mannanase supplementation (0.1 or 0.2%) to a 10% PKM-based rations with either one of the following 3 levels of Kemzyme: 0.1, 0.2 or 0.3% of the rations. Each treatment was replicated 4 times with one pig per pen. The trial ended when the average B.W. of pigs reached 30 kg where the experimental pigs were then used for Experiment 4. It was found that mannanase did not significantly affect ( $P > 0.05$ ) ADG, FC or FCR of the starting pigs. Similarly, Kemzyme did not change ( $P > 0.05$ ) ADG or FC, but caused a progressive improvement ( $P < 0.05$ ) of FCR from 1.78 at 0.1% supplementation to 1.70 and 1.50 for the 0.2 and 0.3% inclusion rates, respectively.

Experiment 4, the growing pigs from Experiment 3 were used in a CRD experiment with 3 dietary treatments (Kemzyme supplementation at 0.1, 0.2 or 0.3% of the ration) and 4 replications with 2 pigs (1 male and 1 female) per experimental unit. Basal diets were PKM-based at the inclusion rates at 20% in the growing and 30% in the finishing periods. Growth performance in each period and carcass characteristics of finished pigs were evaluated. It was found that Kemzyme did not significantly change ( $P > 0.05$ ) ADG, FC or FCR of pigs in either growth period or the carcass length, backfat thickness or loin eye area of the finished pigs.

With respect to cost of feed per kg B.W. gain, replacing of RB by PKM with or without fat supplementation did not significantly change ( $P>0.05$ ) feed cost per kg B.W. of growing finishing pigs. Kemzyme, not mannanase, supplementation tended to decrease feed cost per kg gain of starting pigs but did not significantly affect the feed cost of growing and finishing pigs ( $P>0.05$ ).