

# Soluble and Insoluble Non-Starch Polysaccharides on Digesta Passage Rate and Voluntary Feed Intake of Grower Pigs

A. Owusu-Asiedu<sup>1</sup>, J.F. Patience<sup>1</sup>, B. Laarveld<sup>2</sup>, P.H. Simmins<sup>3</sup>, and R.T. Zijlstra<sup>1</sup>

## Summary

The effects of purified non-starch polysaccharide (NSP) fractions (soluble, guar gum (SOL) and insoluble, cellulose (INSOL)) NSP fractions on digesta passage rate, retention time and voluntary feed intake was studied in grower pigs. Compared to control, adding SOL+INSOL increased digesta viscosity, slowed digesta flow rate and increased retention time in the total tract. Voluntary feed intake and daily weight gain reduced with SOL+INSOL NSP, compared to pigs fed the control diet. Reduction in voluntary feed intake associated with feeding high fibrous diet in pigs may be a direct effect of the fibre fractions slowing the flow rate of digesta through the gastrointestinal tract. Thus, reducing the negative effects of soluble and insoluble NSP may enhance feed intake and improve grower pig performance.

## Introduction

The use of alternative non-conventional feed ingredients to supplement and/or as a substitute to conventional feed ingredients in pig ration

can be attractive economically. However, voluntary feed intake and feed utilization of pigs may be compromised due to broad range of NSP present in the cell walls of plant-based feedstuffs. Non-starch polysaccharides are not digestible, and in certain cases, may act as anti-nutrients due to the lack of appropriate digestive enzymes. The mechanism for the reduction in voluntary feed intake associated with feeding fibrous ingredients is complex and poorly understood. To reduce negative effects of NSP on voluntary feed intake, the physical and chemical characteristics of NSP and the physiological changes occurring in grower pigs due to NSP fractions need to be understood. The hypothesis that reduction in voluntary feed intake associated with feeding high fibrous diets to grower pigs may be directly relate to the NSP fractions (soluble or insoluble) altering digesta passage rate through the gut was tested.

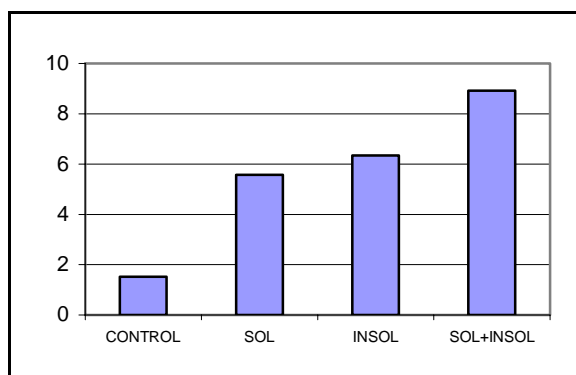
## Experimental Procedure

Twelve grower pigs fitted with ileal T-cannula were used in a two-period change-over design, providing 3 pigs/

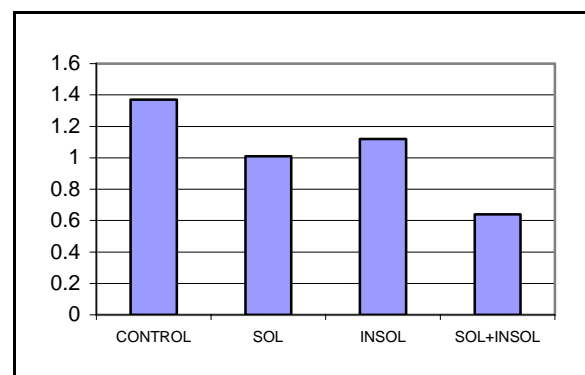


diet/period in the first trial. Experimental period was 18 d: a 13-d acclimation to the experimental diet, a 2-d faeces sampling, a 2-d digesta collection for passage rate and a 1 d blood sampling for plasma glucose and ghrelin levels. Experimental diets were; 1) corn-soybean meal diet with 14% cornstarch, as a purified carbohydrate source (**control**); 2) control diet with 7% soluble NSP (**SOL**); 3) control diet with 7% insoluble NSP (**INSOL**); and 4) control with 7% soluble + 7% insoluble NSP (**SOL+INSOL**), with purified NSP fraction replacing cornstarch at a 1:1 ratio. The control diet was formulated to 3.5 Mcal DE /kg and 2.4 g Dlys/Mcal DE and diets were fed at 3 x maintenance based on the control diet. In trial two, 20 individually housed pigs (5 pigs per treatment) were randomly

**Figure 1.** Fibre fractions on ileal digesta viscosity



**Figure 2.** Fibre fractions on ileal digesta passage rate in grower pigs



assigned to one of four dietary treatments in a 14-d performance trial. Pigs had free access to feed and water daily, and weight gain and feed disappearance were recorded weekly.

Results and Discussion

Addition of SOL and INSOL NSP increased digesta viscosity from 1.52 to 8.92 centipoise, while digesta passage rate decreased from 1.37 to 0.64 %/h, indicating that less digesta flow through the gut with addition of NSP (Fig. 1 and 2). Total tract mean retention time based on initial appearance of ferric oxide in feces was highest for SOL-fed pigs (Figure 3). Plasma glucose reduced by SOL+INSOL prior to morning feeding, but not after feeding, while plasma ghrelin level was highest for SOL and INSOL but not for the control or SOL+INSOL-fed pigs (Fig. 4). Average daily feed intake and daily weight gain decreased with addition of SOL and INSOL NSP, compared to the control diet (Figure 5).

The above studies indicate that purified soluble and insoluble NSP are not inert in the gut and that, individually, or in combination act to increase intestinal viscosity and reduced the flow of digesta through the gastrointestinal tract, thereby reducing voluntary feed intake.

Bottom Line

Both purified soluble and insoluble NSP slowed digesta passage rate and increased total tract retention time in grower pigs, resulting in reduced voluntary feed intake. Reducing the negative effect of dietary NSP by either addition of enzyme or processing may

Figure 3. Fibre fractions on digesta retention time based on initial appearance of ferric oxide in faeces

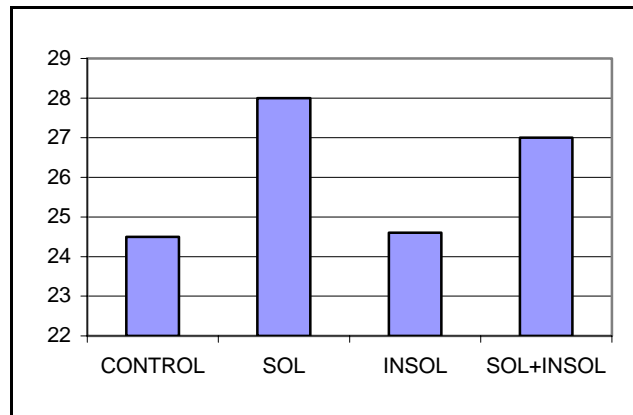


Figure 4. Fibre fractions on plasma ghrelin levels

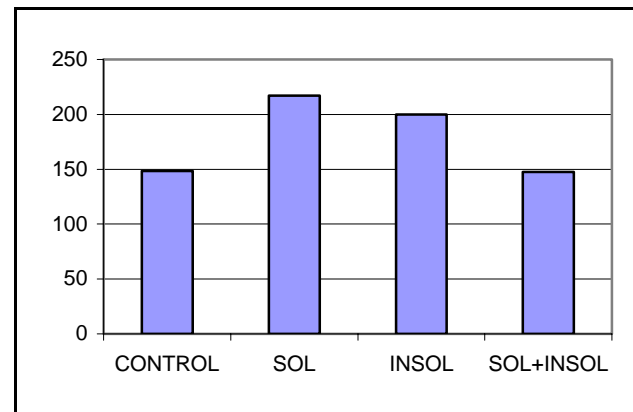


Figure 5. Fibre fractions on daily feed intake and weight gain in grower pigs

