AN APPROACH TO CARCASS TRAITS AND LIVER AND MUSCLE COMPOSITION IN PIGS FED SUGAR CANE FINAL MOLASSES PLUS CrIII

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SUMMARY: Eight YLxD castrated male pigs fed sugar cane final molasses plus torula yeast with or without 0.5 ppm CrIII were used during a fattening period from 30-100 kg. The animals were slaughtered and carcass traits and some organ composition were estimated after a fasting period of 18 hr. A non significant positive influence of CrIII on carcass traits was observed in pigs fed molasses based diet. There was no treatment effect in humidity content of Longissimus, liver and pancreas. Lipid content was significantly low ($P<0.05$) in the pancreas and tended to be low in the liver of pigs fed CrIII. Glycogen content was significantly high ($P<0.01$) in Longissimus and liver of pigs fed CrIII. It is suggested that carcass traits and organ composition might be modified to some extent by CrIII in pigs fed high levels of final molasses in the diet, probably through carbohydrate metabolism manipulation.

INTRODUCTION: Previous studies have shown that pigs fed sugar cane final molasses tend to exhibit certain changes in carbohydrate metabolism, judging from intravenous tolerance tests to glucose and fructose (Ly et al, 1981). Other findings indicate that there is a protein response in performance traits of animals fed sugar cane final molasses when subjected to a previous treatment of intramuscular insulin injections (Castro and Ly, 1986). On the other hand, it has been suggested that a glucose tolerance factor including trivalent chromium (CrIII) is indispensable for cellular membrane permeabilization to glucose (Mertz et al 1974). This factor has been proved to be biologically active in the pig (Steele et al, 1977).

Sugar cane final molasses appears to be devoided of CrIII (Biart et al, 1982). Furthermore, torula yeast, grown on these cane molasses may have the same characteristics. Nevertheless, chromium is not an element commonly added to conventional premixes for commercial formula destined to pigs. On the other hand, it has been claimed that sugar cane final molasses influence negatively several carcass traits such as dressing and backfat thickness (see Christon and Le Dividich, 1978).

The aim of the present communication is to report the results of an experiment designed to study some carcass traits and organ and muscle conditions in pigs fed sugar cane final molasses plus CrIII or not.

MATERIALS AND METHODS: Eight YLxD castrated male pigs fed sugar cane final molasses and torula yeast with or without CrIII were used during a fattening period from 30-100 kg according to a one way classification design (Table 1).

Table 1. Characteristics of the basal diet

Ingredients	% dry basis
Sugar cane final molasses	63.3
Torula yeast	35.4
DL-methionine	0.3
NaCl	0.5
Vitamins and minerals*	0.5
Nutrients	
Dry matter	86.2
Nitrogen	3.02
Ash	13.02
Sucrose	23.48
Glucose	5.06
Fructose	6.46
Gross energy, kjoule/g DM	16.0

* CrIII added or not as chromium sulphate

When pigs arrived an average of 100 kg live weight they fasted overnight (18 hr) and blood samples were collected by venipuncture from vena cava for glucose (Dalhqvist, 1964), fructose (Dische and Borenfreund, 1951) and DL-lactate (Barker and Summerson, 1941) in plasma. Following blood collection the animals were allowed to eat and then fasted again during another 18 hr. The pigs were electrically stunned and slaughtered. Carcass dissection was carried out according to Kielanowski and Osinska (1954). In addition, some organ and muscle indices were also estimated.

Liver and pancreas were isolated and separated from the body cavity inmediately after slaughter. The organ weight was determined and a tissue sample was collected for chemical analyses. Muscle samples from the Longissimus were removed post-mortem and frozen in dry ice. Both groups of organs and muscle were subsequently analyzed for humidity content by drying in an air-forced oven at 60C until constant weight. Humidity content was expressed as the losses in weight of dried samples. Glycogen content in liver and Longissimus was estimated by the anthrone-sulfuric acid method, after digestion with concentrated KOH and isolation with absolute ethanol. Lipid content in liver and pancreas was estimated in dried samples by extraction with petroleum ether (boiling range, 40-60C) in a Soxhlet apparatus.

RESULTS AND DISCUSSION: Table 2 shows the effect of CrIII on fasting values of some plasma hexoses in the pig.

Table 2. Fasting (18 hr) carbohydrate level in plasma of pigs fed sugar cane final molasses plus CrIII

Concentration, mg/dl	-CrIII	+CrIII	SE+
Glucose	97.1	54.9	4.7***
Fructose	1.1	1.1	0.1
DL-lactate	32.1	23.1	2.7+

+ P < 0.10 *** P < 0.001

The plasma glucose level significantly fell (P<0.001) from a value of 87.1 mg/dl in the CrIII-unsupplemented diet to 54.9 mg/dl when this element was included in the feed. A similar trend (P< 0.10) to disminish was observed in DL-lactate concentration. Plasma fructose level was very low and without treatment influence. Steele et al (1977) could not find any influence of a synthetic glucose tolerance factor on glucose tolerance rate on peak insulin response either following an intravenous glucose challenge. Nevertheless although not so high, the fasting plasma glucose level in younger pigs fed sugar cane final molasses has been found to be consistently higher than those obvserved in animals fed cereal based diets (Ly et al 1981).

Table 3. Carcass traits in pigs fed sugar cane final molasses plus CrIII

	-CrIII	+CrIII	SE+
Carcass yield, %	78.8	80.3	1.2
Backfat thickness, mm	25.5	24.7	1.3
Longissimus area, cm2	27.6	30.1	1.2+

+ P < 0.10

Table 3 summarizes data from several carcass traits of pigs fattened with sugar cane final molasses. A non significant positive influence of CrIII on carcass traits was observed in pigs fed molasses based diets. This influence was more marked in the Longissimus area (P<0.10).

Table 4. Organ and muscle conditions of pigs fed sugar cane final molasses plus CrIII

	-CrIII	+CrIII	SE+/-
Organ weight, g/kg body weight			
Liver	25.4	19.4	2.0*
Pancreas	1.02	1.37	0.10*
Humidity, g/100g fresh weight			
Liver	71.1	68.5	0.9
Pancreas	67.7	71.1	0.8
Longissimus	73.0	70.9	1.0
Lipids, g/100g fresh weight			
Liver	5.0	4.6	1.2
Pancreas	6.6	2.9	1.1*
Glycogen, mg/100g fresh weight			
Liver	268	530	15**
Longissimus	20	32	4**

** P < 0.01 * P < 0.05

Organ and muscle conditions are presented in Table 4. While in the liver the effect of CrIII supplementation was in the sense of a significant decrease ($P<0.05$) in organ weight, the reverse occurred for the pancreas. There was no treatment effect on humidity content of Longissimus, liver and pancreas. Lipid content was significanty low ($P<0.05$) in the pancreas and tended to be low in the liver of pigs fed CrIII. Glycogen content was significantly high ($P<0.01$) in Longissimus and liver of pigs fed CrIII.

Reports related to several experiments carried out with pigs fed sugar cane molasses have indicated a non-usual increase in liver weight parallel to a decrease in pancreas weight (see Ly, 1979). Thus it could be considered that CrIII supplementation tended to return organ weight values to conventional levels. On the other hand, the inclusion of CrIII in the sugar cane molasses diminished lipid content in liver, and especially in pancreas ($P<0.05$). On the contrary, CrIII significantly depressed ($P<0.01$) glycogen content in liver and the Longissimus.

CONCLUSIONS: The results presented here suggest, firstly, that although chromium status is not well established in carbohydrate metabolism of the pig, the level and the type of chromium salt used in this study proved to exert some influence on carcass traits and organ conditions of pigs fed high levels of sugar cane final molasses in the diet.

Secondly, the relationship between CrIIIand carbohydrate metabolism in pigs fattened with sugar cane final molasses in the diet tends to influence energy reserves in organs and muscles by decreasing lipid depots and in turn enhancing the glycogen pool.

Thirdly, carcass traits of economical interest could be improved by dietary manipulation, as data presented here tend to demonstrate. More research in this direction probably could confirm strongly these assumptions.

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