

RESPONSES OF RATS TO DIFFERENT LEVELS OF PHOSPHORUS
WITH CONSTANT OR VARIABLE CALCIUM:PHOSPHORUS RATIOS

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A slope ratio assay technique has been developed to assess phosphorus (P) availability in feed ingredients for pigs (Cromwell 1980). The technique involves feeding the pigs suboptimal amounts of P with optimum calcium (Ca) levels resulting in a wide variation in Ca:P ratio. Bone strength (bone bending moment, BBM) is taken as the response criterion. It is not clear whether BBM is a suitable response criterion in the rat. This experiment investigated the responses of rats to various dietary P levels with constant or variable Ca:P ratios. There were ten experimental diets containing five levels of total P (0.9, 1.8, 2.6, 3.5 and 4.4 g/kg) with either constant (1.3:1) or variable Ca:P ratios (1.3, 1.6, 2.1, 3.1 and 6.2:1). The diets were formulated by substituting the required amounts of calcium carbonate and monosodium phosphate for sugar in soyabean meal and sugar-based diets. The diets were offered *ad libitum* to 60 laboratory rats (4 weeks old) for 21 days. The rats were then sacrificed and the right femur bone used for bone ash and for BBM determinations.

Weight gain, bone ash and BBM responded in a significantly linear ($P < 0.01$) and quadratic ($P < 0.05$) fashion to the level of P in the diet (Fig. 1 and 2). Weight gain was significantly ($P < 0.01$) lower on the variable Ca:P ratio compared to the constant Ca:P ratio diet. On the other hand, Ca:P ratio did not affect bone ash or BBM.

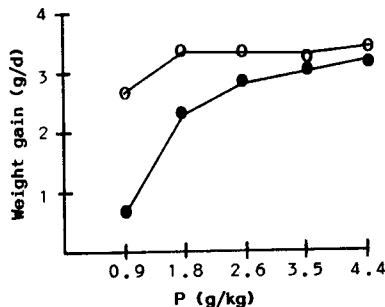


Fig 1. Weight gain in response to P levels. O, constant Ca:P ratio; ●, variable Ca:P ratio.

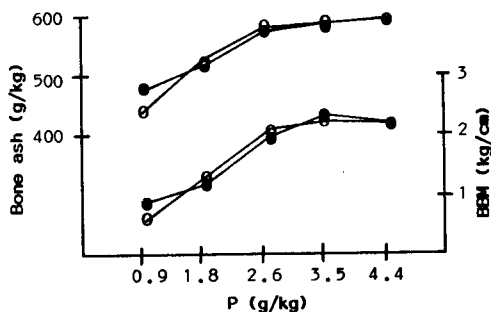


Fig 2. Bone ash and BBM in response to P levels. O, constant Ca:P ratio; ●, variable Ca:P ratio.

The results indicate that a wide range of Ca:P ratio can be formulated in the slope ratio assay without affecting the BBM values. However, in P requirement experiments, the ratio should be within an acceptable range so that weight gain and feed efficiency are not impaired.

CROMWELL, G.L. (1980). *Feedstuffs* 52:38.

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