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Review article

The use of sweet potato (*Ipomoea batatas* (L.) Lam) root as feed ingredient for broiler finisher rations in Papua New Guinea

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ABSTRACT

The use of non conventional feedstuffs in poultry rations is now a common practice in developing countries where most of the ingredients used in the production of commercial poultry stockfeed are imported grains. The prices of these grains are dictated by world market prices and this translates into high retail prices for the end users. The purpose of this review is to highlight the potential of sweet potato root as a poultry feed ingredient especially for finishing off broilers in Papua New Guinea where this root crop is in abundance. This review discusses in general the metabolisable energy value of this crop when compared to maize and its impact on the intake of broilers when processed differently and fed at various inclusion rates. Trypsin inhibitors are the major anti-nutritive factor present in sweet potato roots; however these are eliminated with heat moisture treatments. The dietary fibre in sweet potato roots have been shown to have anti-microbial and prebiotic attributes which may be beneficial in promoting good gut health in chickens. The use of exogenous enzymes in sweet potato diets is briefly mentioned in this review. All in all, sweet potato roots can be included in diets for broiler chickens at 30% without adversely affecting intake of birds if processed correctly. However, to date limited information is available on how sweet potato can enhance digestive capacity of broiler in terms of gut morphology and digestive enzyme activities, as well as the shedding of the main zoonotic bacteria such as Campylobacter and *Clostridium perfringens*. The shedding of these bacteria in relation to food safety is important if sweet potato is to be used regularly in finishing off broilers in PNG.

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Abbreviations: PNG, Papua New Guinea; NSP, non starch polysaccharides; AME, apparent metabolisable energy; WSNSP, water soluble non starch polysaccharides; WINSP, water insoluble non starch polysaccharides; FCR, feed conversion ratio; SPRM, sweet potato root meal; NE, necrotic enteritis.

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1. Introduction

The cost of growing poultry, pigs and fish (inland aquaculture) is very high as feed alone makes up to 80% of the total cost of animal production in Papua New Guinea (PNG) (Ayalew, 2011). Village livestock production is constrained by the high cost of grains imported for making commercial livestock feed. Virtually none or very little locally available ingredients in the form of agro-industrial by-products, or traditional root crops such as cassava, plantain or sweet potato is used by feed manufacturers. The cost of commercial feeds has increased from 56 to 110% between February 2003 and July 2011 (Ayalew, 2011). This has placed a negative economic constraint on backyard, small and semi-commercial poultry farmers who raise poultry as a source of income. Sweet potato can be promoted as a major energy source for poultry, especially broilers in the live broiler chicken markets. It is currently being used by the backyard and small-scale broiler producers as the cheaper feeding options to finish off broilers. Greater and regular use of this root crop in broiler diets can be promoted if more in-depth work is done on understanding production parameters, digestive health and food safety issues associated with this crop when utilised in broiler finisher diets. Continual increases in the cost of conventional ingredients further justify rational and efficient use of this crop in broiler diets in developing countries such as PNG.

2. Importance of sweet potato in developing countries

Sweet potato is ranked sixth in the world as the most important food crop after rice, wheat, potatoes, maize and cassava (CIP, 2010). It can grow in marginal conditions, requiring little labour and chemical fertilizers. It is a cheap, nutritious solution for developing countries needing to grow more food on less area of land. It is a major traditional staple and feed crop in the eastern and outlying islands of Indonesia and the highlands of West Papua (Campilan, 2009).

Papua New Guinea is regarded as the second most important centre of sweet potato genetic diversity in the world (Liu et al., 2010). There are about 5000 cultivars grown in PNG; no single cultivar dominates production or trade and there is a wide variation in flesh and tuber skin colour. The national average consumption of sweet potato is 260 kg/person/year (Chang and Kewa, 2014). In PNG, sweet potato is becoming a cash crop for smallholder farmers driven by the need to generate income in a modernizing market economy. Thus, greater utilization of the crop as an ingredient for raising livestock especially poultry would enhance the value of this crop further for both sweet potato farmers and small-scale poultry producers.

3. Chemical composition of sweet potato roots

Sweet potato is composed largely of starch, cellulose, hemicellulose, pectin and sugars. The carbohydrate content accounts for 800–900 g/kg of the total dry mater content. The dry matter content ranges from 130 to 480 g/kg and varies depending on the cultivars, cultural practices and local climatic conditions (Bradbury and Holloway, 1988).

3.1. Starch

Starch accounts for about 600–700 g/kg of dry matter in sweet potato roots and cultivar characteristics dictate the starch content of roots (Padmaja, 2009). Sweet potato starches are composed of 300–400 g/kg amylose and 600–700 g/kg amylopectin (Padmaja, 2009; Waramboi et al., 2011). Physiochemical properties of sweet potato starch depend at least in part on the amylose/amylopectin ratio thus the digestibility of sweet potato starch is negatively correlated with its amylose