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Nutritional characterization of some tropical urban market crop wastes

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Abstract

Market crop wastes of banana (*Musa acuminata*) leaves and pseudo-stem sheaths, sweet potato (*Ipomoea batatas*) vines and *Solanum aethiopicum* (traditionally known as *nakati*) were collected from three major markets in Kampala (Uganda). The wastes were evaluated for chemical composition during the dry and wet seasons, rumen degradation using three cannulated indigenous mature ewes, and digestibility using 12 indigenous intact growing male goats, 4–6 months old and weighing 15.8 kg (S.D. 2.1). The goats in the digestibility study were kept in metabolism cages and fed the wastes as sole diets, either fresh or wilted.

Mean dry matter (DM) content was 97, 121, 197 and 216 g/kg for pseudo-stem sheaths, *nakati*, sweet potato vines and banana leaves, respectively. Crude protein (CP) was 34, 109, 112 and 114 g/kg DM for pseudo-stem sheaths, banana leaves, sweet potato vines and *nakati*, respectively. The chemical composition was similar among seasons and markets for the banana based wastes. However, for sweet potato vines and *nakati*, the wet season wastes had significantly higher CP and lower NDFom and ADFom. Chemical composition was different ($P<0.05$) among the markets for *nakati*. Effective

Abbreviations: ADFom, acid detergent fibre expressed exclusive of residual ash; BW, body weight; CP, crude protein; DE, digestible energy; DM, dry matter; ED, effective degradability; EE, ether extract; Lignin (sa), liginin determined by solubilization of celluluose with sulphuric acid; ME, metabolizable energy; MUARIK, Makerere University Agricultural Research Institute, Kabanyolo; N, nitrogen; ND, not determined; NDFom, neutral detergent fibre not assayed with a heat stable amylase and expressed exclusive of residual ash; OM, organic matter; P, probability; PD, potential degradability; SD, standard deviation; SE, standard error of means.

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degradability differed (P<0.05) between the wastes, averaging 0.43 (banana leaves), 0.47 (pseudo-stem sheaths) and 0.56 (*nakati*) to 0.69 g/g DM incubated (sweet potato vines). DM intake, N retention and digestibility were not significantly affected by wilting. Average DM intake was 176, 270 and 559 g/day; CP intake was 26, 30 and 63 g/day, while metabolizable energy (ME) intake was 1.3, 1.7 and 5.1 MJ/day for *nakati*, banana leaves and sweet potato vines, respectively. N retention (as a fraction of N intake) was −0.51 (banana leaves), 0.62 (*nakati*) and 0.39 (sweet potato vines). The organic matter (OM) and CP digestibilities of banana leaves were low, averaging 0.52 and 0.49, respectively. The high moisture content of *nakati* wastes resulted in low intake, whereas banana leaves had a low degradation rate and a low N retention. Market sweet potato vine wastes were sufficient to provide the CP and ME required by growing goats under tropical conditions.

Keywords: Urban market crop wastes; *Ipomoea batatas*; *Musa acuminata*; *Solanum aethiopicum*; Nutritive value

1. Introduction

The marketing of many crops in developing countries is done in their raw form, with the traders providing the link between the rural producers and the urban consumer markets. This practice has been reported to be a key source of crop waste in urban markets. It is estimated that more than 18,000 MT of crop wastes are generated within the markets of Kampala (Uganda) per year (Ekere, unpublished data). These wastes are either collected and dumped by the city authorities or to some extent used as animal feed, as green manure or are for several reasons left uncollected in the markets (Sendawula et al., 1997) causing serious environmental and social problems. According to Ekere (unpublished data), the biggest volume is linked to three important staple foods: banana (*Musa acuminata*), sweet potato (*Ipomoea batatas*) and *Solanum aethiopicum* (a vegetable grown for its leaves, and traditionally known as *nakati*), which are known for their continuous supply throughout the year.

The regular use of these market wastes as animal feed in the urban and peri-urban livestock keeping system, where there is insufficient or no herbage grown for feeding livestock, may reduce the problems of waste disposal in developing countries. However, their successful use as animal feed should take into account their feeding value (Preston, 1986), and hence try to increase the efficiency with which they can be used. The wastes with a high nutritional value should be used in animal feeding and the poor ones ploughed back for soil amendment. As a first assessment the degradation rate in the rumen should be estimated. Preston (1986) suggests that if the dry matter (DM) degradation rate is less than 0.4 after 48 h of incubation in the rumen, then the waste is unsuitable for feeding directly to animals. If large quantities of such a product are available, it may be justified to attempt to increase its nutritive value by chemical treatments. However, attempts to increase the nutritive value by chemical treatments have been reported to have very slow implementation in developing countries (Owen and Jayasuriya, 1989), because of socio-economic factors (Dolberg, 1992).

Although the demand for some market crop wastes is already high, particularly sweet potato vines wastes, as illustrated by the fact that they are only available to the urban and peri-urban livestock keepers at a cost, information on their nutritional feeding value is