EFFECTS OF SWEET POTATO LITTERS AS SUPPLEMENTAL FEED ON THE MEAT PRODUCTIVITY AND MEAT QUALITY OF PIGS

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Introduction

The use of natural materials such as sweet potato litters as supplemental feed is may prove to be ideal. Recently, inclusion of the use of the leaves and stems of plants are on the concern of many researchers through the world, particularly in Japan. Generally, in Kyushu Island, located in the southern part of Japan, many litters and residual aspects of plants (e.g. sweet potato plants) are discarded without benefit. In previous studies, we have determined the effectiveness of introducing the litters and the leaves of sweet potato to the diet of egg-laying hens. We found that when sweet potato litters increased their diet the feed intake of birds increased (Takenoyama et al., 2007). These data suggested that sweet potato litters may also have significant effects on the productivity of meat animals such as pigs and beef cattle as well as dairy cattle. To increase the feed intake of animals, studies must been conducted on the variations of their diets. The purpose of this study was to utilize the leaves and stems of the sweet potato to determine whether they could be used as functional forage for pigs. This study investigated the effects of these litters on the growth condition of pigs, meat productivity and nutritional quality of the meat. Meat quality, in this context, included lipid content, vitamin E content and fatty acid compositions, among others.

Materials and Methods

Animals subjected to this treatment were pigs of a new generation from ternary cross- breeding (Large White × Landrace × Duroc). The pigs were divided into two groups based on diet type. The control group has fed an ordinary diet, while the experimental group was fed an ordinary diet supplemented by sweet potato litters (5%). The forage was added when the animals weighed 30kg each and the feeding diet was completed when those animals had gained 110kg. The animals were grown up in normal environmental conditions at a stable in the Miyazaki Livestock Research Center. The animals were subjected to weight gain tests and body size determination before being slaughtered. We examined the growth of those animals (including fattening days, daily weight gain, feed intake, feed demand rate, etc.). Then, the animals were slaughtered in a local slaughtering-house and were measured for their meat productivity. Thereafter, all of the postmortem pigs were subjected to further tests such as carcass traits (back fat thickness, carcass length, loin length, etc.). The meat quality was measured for nutrient contents. Vitamin E content was determined by the method of Yamauchi et al., (1980). Lipid content and the fatty acid compositions were also examined by the method of Takenoyama et al., (1999). Extra examinations of the internal organs of the carcasses were conducted to determine the animals' health conditions after being fed the sweet potato forage.

Results and Discussion

The animals found this diet to be highly palatable, as demonstrated by observing the forage consumption. As a result, this diet positively affected the growth of the pigs. The number of fatting days and the daily gain weight in the experimental sample were consistent with the control samples. Feed intake in the test group was significantly less than the feed intake of the control animals (Table 1).

Table 1. Effects of sweet potato litters as supplemental feed on growth condition of pigs.

Sample	Fattening Days	Daily Gain	Feed Intake (kg)		Feed Demand**
Control (n=8)	78.8	1.019 (kg/day)	225.3	[concentrate*]	2.849 (kg/kg)
Test (n=8)	83.8	0.950 (kg/day)	229.7	218.2	2.768 (kg/kg)

*Concentrate means commercial basal diet.
**This value shows the demand rate of the commercial basal diet.

The postmortem examinations revealed no significant differences in the body traits of the two samples. (Table 2). The appearance of the pigs' internal organs and glands such as the heart, liver and intestines were

slightly better than that of the pigs fed with the ordinary diet. The number of inedible internal organs of the experimental group decreased when compared to that of control group. As a result, an examination of carcass traits also showed no significant differences between the two groups (Table 3).

Table 2. The effects of sweet potato litters on the body morphology of pigs.

Sample	Body Length	Height	Chest Depth	Front Width	Center Width	Back Width
Control (n=8)	104.4 cm	63.6 cm	35.2 cm	35.1 cm	32.1 cm	32.3 cm
Test (n=8)	102.3 cm	63.5 cm	34.7 cm	34.5 cm	31.5 cm	33.4 cm

Table 3. The effects of sweet potato litters on carcass traits of pigs.

Sample	Carcass Length	Carcass Width	Loin Length	Fat Thickness		
				Shoulder	Back	Waist
Control (n=8)	91.9 cm	34.4 cm	54.7 cm	3.7 cm	2.1 cm	3.2 cm
Test (n=8)	91.3 cm	34.1 cm	55.6 cm	3.7 cm	2.0 cm	2.9 cm

From the data of the nutrient composition, we found that vitamin E content in the loin muscle slightly increased in the litter-fed pigs. In spite of that α-tocopherol in vitamin E in fat tissues was significantly increased ($P < 0.01$) (Figure 1). The small increase in the lipid content in the loin muscles was insignificant and it did not change in the fat tissues. Fatty acid compositions remained at a normal level without any change.

The feasibility of this study was in utilizing the litters of sweet potato as forage for pigs generated from ternary cross breeding and ecologically benefit from using materials that would otherwise be discarded. This type of litter has not yet been utilized as forage for livestock. Therefore, we believed this research must be conducted in order to benefit from such materials to elevate the economic conditions of those who concern about meat production.

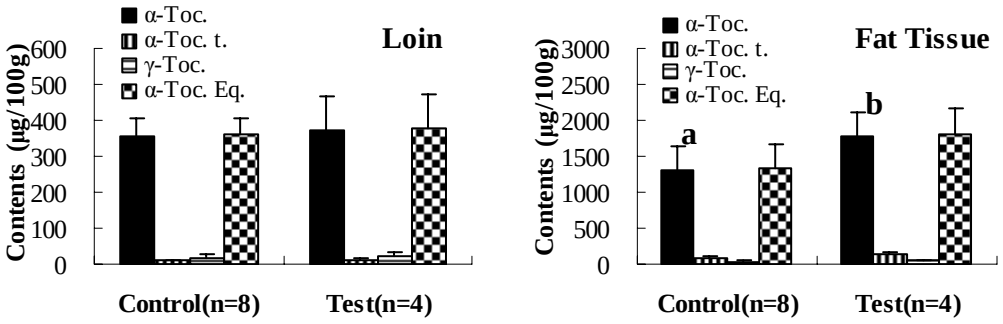

Figure 1. Effects of sweet potato litters on vitamin E contents in loin and fat tissues in pigs. Values with different superscripts (a-b) within same row differ significantly ($P < 0.01$).

Conclusions

In this study, we investigated the effects of sweet potato litters on the growth of pigs, meat productivity and nutritional quality of the meat to determine whether the leaves and stems of sweet potato litter can be utilized as functional forage. The meat of the pigs fed the litter-infused diet was nutritionally improved, particularly in the level of vitamin E content of the meat, which was increased significantly in the fat tissues. When these pigs were fed this forage, their feed demand of commercial basal diet was decreased. This decrease in feed intake in the treated animals was considered to be advantageous. From the economic point of view, this reduction in the feed intake could considerably contribute to the financial condition of those who concern about meat production. Most of the ingredients in the diets that used by these companies are imported from overseas. Therefore this kind of forage can be used instead of any other expensive ingredients that come from overseas.

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