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Effect of water spinach, water hyacinth and banana stem on growth performance of Muscovy duck fed of rice bran and rice distillers by product as basal diets

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Abstract

The objective of the study was to evaluate the effect of green feed from water spinach, water hyacinth and banana stem on feed intake, daily gain, feed conversion ratio and growth performance of Muscovy duck fed on rice bran and rice-distiller by product as basal diets. There were 4 treatments and design in RCBD with 4 replications of each treatment. Growing Muscovy ducks (n=64) were fed a basal diet of rice bran and rice distiller's byproduct with three sources of greed plants: Water spinach, banana stem and water hyacinth. Supplements of water spinach, banana stem and water hyacinth supported growth rate of 36.7-44.9g/day. And higher on mixture with water spinach than other feeds. However, Supplementation with water spinach was not affected on DM feed conversion, but led to lower.

Keywords: Rice Distiller's Byproduct; Feed Conversion; Green Feeds; Live Weight Gain; Local Feed Resources

1. Introduction

Poultry production is a common activity in Southeast Asia, and is a major source of livelihood for over a million people in the rural areas. (Chein Tai and Jui-Jane Liu Tair 2001).

Ducks are reared traditionally by poor farmers for their livelihood. Duck is one component of integrated farming systems which are regarded as being part of a sustainable development in agriculture (Bui Xuan Men 2010).

At smallholder level, many farmers have not enough money to buy the high-quality protein sources such as fish meal and soybean meal that are the basis of intensive livestock feeding systems.

Water spinach grows in marshy or wet sandy areas or floating on water in many parts of tropical regions in the world (Bruemmer and Roe 1979). The fresh water spinach contains from 20 to 31 % crude protein on a DM basis (Bui Huy Nhu Phuc 2000; Ly the Luyen and Preston 2004)

Rice distillers' by-product is the residue from production of alcohol made from sticky rice, maize, sweet potato, cassava and bananas (Oestrike and Ventilate 2003). Studies in Vietnam by Luu Huu Manh et al (2000) and Luu Huu Manh et al (2009) reported a mean protein content of 23% high quality protein in the DM. These authors suggested that this by-product was appropriate for supplementing feeds of lower nutritional density

Water hyacinth (Eichhornia crassipes) floats on water surfaces throughout SE Asia and is considered to be a common weed because of its capacity to grow and reproduce on nutrient-rich water bodies (Le The Men et al 2002). The young,

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light-green leaves and stems are rich in crude protein (18% on a DM basis) and have been fed to pigs in the Mekong Delta (Le The Men 2006), so it should be palatable to ducks also.

In the research reported here, it was hypothesized that: (i) the performance of growing Muscovy duck fed of rice bran and rice distillers by product as basal diets would be improved by supplementation with water spinach, banana stem, water hyacinth or mix together

Objectives

To compared the effect of green feed from water spinach, water hyacinth and banana stem on feed intake, daily gain, feed conversion ratio and growth performance of Muscovy duck fed on rice bran and rice-distiller by product as basal diets.

2. Materials and methods

2.1. Location of the study area

The experiment was conducted in the Animal Science Farm and Laboratory of the Faculty of Agriculture and Forest Resource, Souphanouvong University, LuangPrabang Province, Lao PDR. The site is located 7.5 km from LuangPrabang Town to the South-west, at an altitude of 385m above sea level. The experiment was conducted from October 2024 to January 2025.

2.2. Treatments and experimental design

The experiment was arrangement in a Randomized Completely Block Design (RCBD) with 4 treatments and four replications.

2.3. The treatments were

- RRWS= Rice bran 65% + Rice distillers' by-product 25% + water spinach 10%
- RRBS= Rice bran 65% + Rice distillers' by-product 25% + Banana stem 10%
- RRWH= Rice bran 65% + Rice distillers' by-product 25% + water hyacinth 10%
- RRWSBH= Rice bran 65% + Rice distillers' by-product 20%+ water spinach 5% + Banana stem 5% and water hyacinth 5%

Table 1 Composition of the diets (DM basis)

Ingredient	RBWS	RBBS	RBWH	RBWSBH
Rice bran	65	65	65	65
Rice distillers' by-product	25	25	25	20
Water spinach	10	-	-	5
Water hyacinth	-	-	10	5
Banana stem	-	10	-	5
CP in DM, %	21.3	19.6	20.7	20.8

2.4. Animals and management

Muscovy ducks (n=64 heads) were used with initial body weight about 900-1,000g/head and 4 weeks of age. They were purchased from farmers and raised in pens (4 ducks per pen). Ducks were vaccinated against Duck Plague and de-warmed before the start of the experiment. They were housed in individual pens, which was constructed of local materials such as grass leaves, small wood and bamboo as dimension of width 0.8m, length 0.8 and height 0.9m and there were spaces in the pen floor to let the feces drop

Figure 1 Ducks confined in the pens

2.5. Feed and management

Rice bran was purchased from rice mill; rice distiller's byproduct was purchased from farmers. Water spinach and water hyacinth were collected daily from natural stands pond in the University campus; banana stem was purchased from farmers. The green feeds (water spinach, water hyacinth and banana stem) were chopped in to small piece (0.5-1cm length) all feeds were mixed together (According in the proportion showed in table 1), and put in the feed trough. Water was supplied ad libitum in a plastic bucket. The feed was given two times per day at 7:30AM and 16:00 PM, the feed was fed ad libitum.

Figure 2 Rice distillers' by-product

Figure 3 Banana stem

Figure 4 Water spinach

Figure 5 Water hyacinth

2.6. Data collection

Live weight was recorded in the morning before feeding at the beginning and at the end of each period. 7 days per period, until to 10 periods (70 days). The sample of feed offer and residues were record daily and store in the refrigerator. At the end of each period a sub-sample were mixed together for DM analysis. The experiment lasted 80 days, excluding adaptation and organizing periods

2.7. Chemical analyses

The sub-samples of feces and of feeds offered and refused were analyzed for DM, N and ash according to AOAC (1990) methods.

2.8. Statistical analyses

Data for feed intake, live weight and feed conversion ratio were analyzed with the General Linear Model option of the ANOVA program in the MINITAB software (Minitab 2000) Source of variation were: ducks, periods, treatment and error

3. Results and discussion

3.1. Chemical composition

The concentrations of crude protein were higher, but ash and DM were lower, DM were higher, in rice bran than others (Table 2).

Table 2 The chemical composition of feed (% in DM, except DM which is on fresh basis)

Items	DM	N*6.25	Ash
Rice bran	91.5	9.8	8.2
Banana stem	11.2	4.7	6.5
Water spinach	9.6	18.3	10.2
Water hyacinth	14.2	10.4	9.5
Rice distiller's byproduct	7.8	23.8	1.4

3.2. Feed intake, growth rate and feed conversion

DM feed intake, g/day was not affected, but DM intake expressed as a percentage of live weight was affected by supplementation with all greed feeds as water spinach, banana stem and water hyacinth (Table 3).

Table 3 Mean values for feed intake by ducks fed rice bran and rice supplemented with water spinach, water hyacinth and banana stem

	RRBS	RRWH	RRWS	RRWSBH	*P*	SEM
DM intake, g/d						
Total DM intake, g/day	487	499	489	475	0.21	7.96
Intake/kg LW	73 [a]	74 [a]	65 [b]	66 [b]	<0.001	0.72

Daily live weight gain and final weight were improved by feeding with water spinach, banana stem and water hyacinth and higher on mixture feed with water spinach (Table 4, Figures 4 and 5)

Table 4 Mean values for live weight change, feed DM intake and DM feed conversion for ducks fed rice bran and rice supplemented with water spinach, water hyacinth and banana stem\

	RRBS	RRWH	RRWS	RRWSBH	*P*	SEM
Live weight, kg						
Initial	950	906	981	1,025	0.891	110.80
Final	2,888 [b]	2,975 [b]	3,481 [a]	3,013 [ab]	0.014	115.10
Daily gain, g/day	36.7 [b]	36.8 [b]	44.9 [a]	38.4 [ab]	0.010	1.61
DM intake, g/day	73 a	74 [a]	65 [b]	66 [b]	<0.001	0.72
DM feed conversion	3.33	3.45	2.74	3.10	0.371	0.29

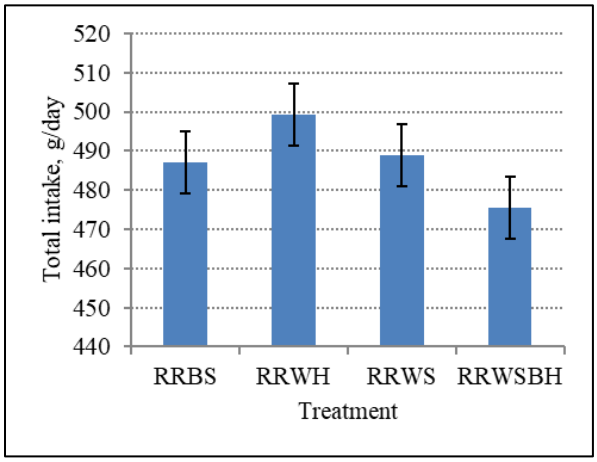

Figure 6 Total intake, g/day

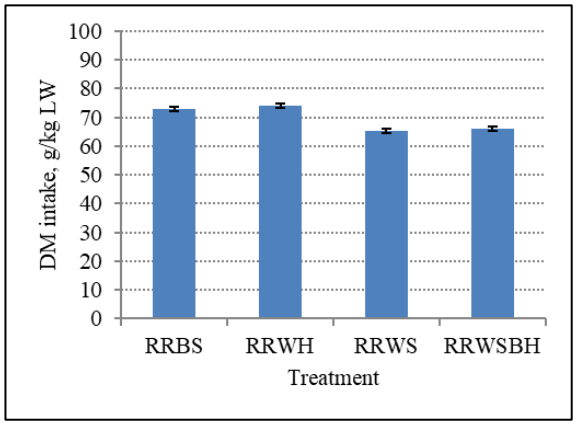

Figure 7 DM intake, g/kg LW

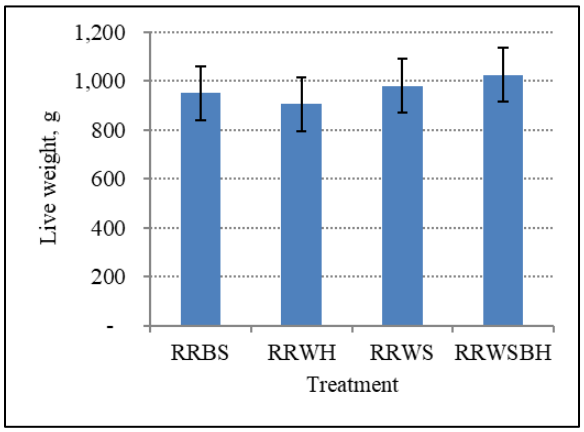

Figure 8 Initial weight, g/head

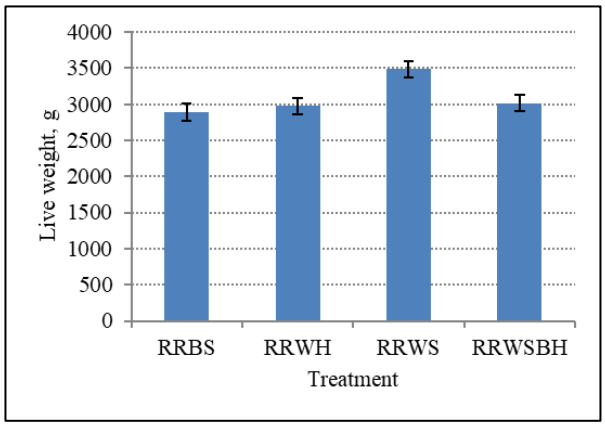

Figure 9 Final weight, g/head

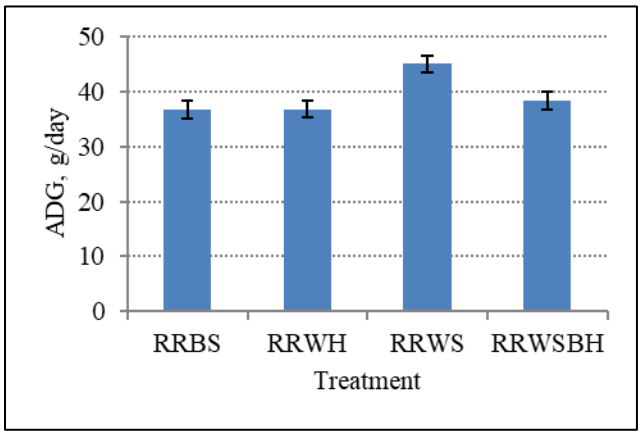

Figure 10 Average Daily Gain of Duck fed on basal diet of rice bran and rice distiller's byproduct

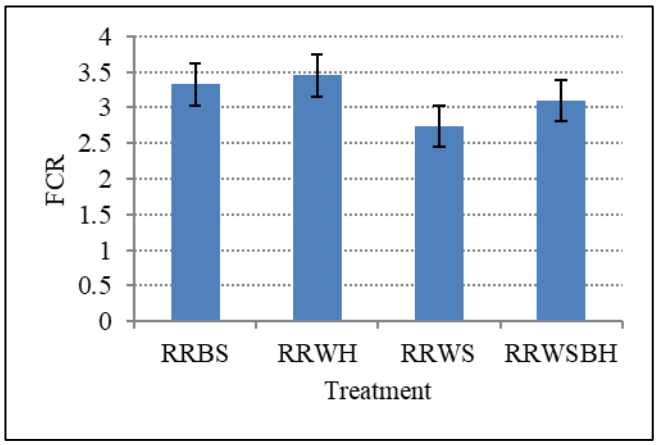

Figure 11 Feed Conversion Ratio fed on basal diet of rice bran and rice distiller's byproduct

4. Discussion

The results of this experiment agree with the findings of: (i) Phongphanith (et al 2010) have been reported that diets have 50% water spinach and rice bran 50% (DM basis) supported relatively high rated of feed intake (140 g DM/kg LW/day). ADG at 26.5 g and FCR 5.28, who was used rice bran as basal diets and supplemented with water spinach, duck weed and ensiled taro leaves.

(ii) Tien D T M et al (2014) reported when increased silage of banana stem in the diets at 0, 20, 40, and 60% with taro foliage for duck the result were increased on feed intake, growth rates and feed conversion were improved when banana pseudo-stem replaced 60% of the taro foliage in the mixed silage, the overall contribution of the silage to the diet DM being 31%, who was study the Performance of common ducks fed an ensiled mixture of banana pseudo-stem and taro (Colocasia esculenta) foliage as a supplement to restricted rice bran and ad libitum fresh duckweed

5. Conclusion

Supplementing rice bran and rice distiller's byproduct with water spinach supported growth rates of 44.9 g/day in Muscovy ducks. Supplementation with water spinach led to lower on DM feed conversion all diets in the range of 2.74 - 3.45.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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