



ການຈະເລີນເຕີບໂຕ ຂອງ ເປັດເທດ ທີ່ລ້ຽງດ້ວຍແໜ, ບອນໝັກ ແລະ ຜັກຕົບ

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ພາກວິຊາ ວິທະຍາສາດການລ້ຽງສັດ, ຄະນະກະເສດສາດ ແລະ ຊັບພະຍາກອນປ່າໄມ້, ມະຫາວິທະຍາໄລສຸພານຸວົງ

ບົດຄັດຫຍໍ້

ການຊອກຫາແຫຼ່ງວັດຖຸດິບຂອງອາຫານ ເພື່ອເປັນອາຫານທົດແທນ ແມ່ນມີຄວາມຮຽກຮ້ອງຕ້ອງການຢ່າງສູງ ໃຫ້ແກ່ການລ້ຽງສັດ ໃນ ສປປ ລາວ, ໃນນັ້ນ ແໜ, ບອນໝັກ ແລະ ຜັກຕົບ ແມ່ນພືດທີ່ມີຄຸນຄ່າທາດອາຫານສູງ ໃຫ້ແກ່ການລ້ຽງສັດ, ດັ່ງນັ້ນ, ການສຶກສາໃນຄັ້ງນີ້ ແມ່ນເພື່ອປະເມີນຜົນຂອງການລ້ຽງດ້ວຍ ແໜ, ບອນໝັກ ແລະ ຜັກຕົບ ທີ່ມີຕໍ່ການຈະເລີນເຕີບໂຕ ຂອງ ເປັດເທດ, ນໍາໃຊ້ລູກເປັດເທດທັງໝົດ 72 ໂຕ (526.39 ± 34.39 g/ໂຕ) ເລີ່ມແຕ່ອາຍຸ 5 ອາທິດ ຮອດ 11 ອາທິດ (ໃຊ້ເວລາເຮັດການທົດລອງທັງໝົດ 7 ອາທິດ) ໂດຍ ໃຊ້ຮູບແບບທົດລອງທີ່ມີ 2*3 ປັດໃຈ (2 ວິທີການໃຫ້ອາຫານ ແລະ 3 ປະເພດອາຫານ), ນໍາໃຊ້ວິທີການສຸ່ມເອົາລູກເປັດໃສ່ແຕ່ລະສິ່ງທົດລອງ (ມີ 3 ຊໍ້າ/ສິ່ງທົດລອງ) ລວມທັງໝົດມີ 6 ສິ່ງທົດລອງ ຄື: 1) ແໜປະສົມກັບຮໍາ (MDR), 2) ບອນໝັກປະສົມກັບຮໍາ (MTR), 3) ຜັກຕົບປະສົມກັບຮໍາ (MWR), 4) ແຍກຮໍາ ແລະ ແໜ (SDR), 5) ແຍກຮໍາ ແລະ ບອນໝັກ (STR), 6) ແຍກຮໍາ ແລະ ຜັກຕົບ. ນໍາໜັກໂຕ ແມ່ນບັນທຶກທຸກໆອາທິດ ແລະ ນໍາໃຊ້ຄິດໄລ່ຊອກຫານໍ້າໜັກເພີ່ມສະເລ່ຍຕໍ່ວັນ, ນໍ້າໜັກສະເລ່ຍໃນແຕ່ລະອາທິດຂອງກຸ່ມ MDR, MWR ແລະ SDR ແມ່ນມີນໍ້າໜັກຫຼາຍກວ່າ ($p < 0.05$) ກຸ່ມ MTR, STR ແລະ SWR. ເປັດເທດລ້ຽງດ້ວຍ MDR ຢູ່ທີ່ມີອາຍຸ 8 ອາທິດ ແມ່ນມີອັດຕາການເພີ່ມຂຶ້ນ ຂອງ ນໍ້າໜັກໂຕ ສູງກວ່າໝູ່ ($p < 0.05$), ການສຶກສາໃນຄັ້ງນີ້ ແມ່ນໄດ້ສະແດງໃຫ້ເຫັນວ່າ ແໜ ແມ່ນພືດທີ່ມີຄວາມເໝາະສົມ ແລະ ມີຄຸນຄ່າທາດອາຫານສູງ ໃຫ້ແກ່ການລ້ຽງເປັດເທດ ເປັນຕົ້ນແມ່ນມີຄຸນຄ່າໃນການແລກປ່ຽນອາຫານມາເປັນຊີ້ນ, ອັດຕາການກິນໄດ້ ແລະ ການເພີ່ມຂຶ້ນຂອງນໍ້າໜັກໂຕ ($p < 0.05$), ໃນການສຶກສາຕໍ່ໜ້າ ເພື່ອເຮັດໃຫ້ເປັດເທດ ໄດ້ຮັບທາດອາຫານຢ່າງພຽງພໍ ຈຶ່ງຂໍແນະນໍາໃຫ້ມີສ່ວນປະສົມສຸດອາຫານ ດ້ວຍພືດຫຼາຍຊະນິດ.

ຄໍາສໍາຄັນ: ເປັດເທດ, ການຈະເລີນເຕີບໂຕ, ຜັກຕົບ, ແໜ, ບອນໝັກ.

Growth Performance of Muscovy Ducks fed Duckweed, Taro Silage, and Water Hyacinth

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Abstract:

Seeking for alternative feed resource is a major critical concern for animal production in Laos. Duckweed, taro and water hyacinth are well known as nutritive plants for animals. Therefore, this study was conducted to evaluate the effect of duckweed, taro silage and water hyacinth on the growth performance of Muscovy ducks. The study was carried out with 72 ducklings (526.39 ± 34.39 g/bird) from week 5 to week 11 of age (7 weeks of the trial period) in a 2*3 factorial arrangement (2 feeding models and 3 ingredients). The birds were randomly allotted to three replicates each of the six treatments: 1) Mixed (ratio 1:1) duckweed with rice bran (MDR), 2) Mixed (ratio 1:1) taro silage with rice bran (MTR), 3) Mixed (ratio 1:1) water hyacinth with rice bran (MWR), 4) Separated duckweed and rice bran (SDR), 5) Separated taro silage and rice bran (STR), and 6)

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Separated water hyacinth and rice bran (SWR). Weekly body weights were measured and used to determine average daily body weight gain. MDR, MWR and SDR were significantly higher ($p < 0.05$) body weight than that of MTR, STR and SWR. Highest value ($p < 0.05$) of average daily gain was observed in a group of ducks fed MDR at week 8 of age. Results from this study showed that duckweed is comparative utilizable and valuable ingredient for Muscovy duck in terms of feed/gain, feed intake and final body weight ($p < 0.05$). Further study is recommended to formulate diet with varied feed ingredients to provide sufficient nutrition for Muscovy duck.

Keywords: Muscovy duck, Growth performance, Duckweed, Taro silage, Water hyacinth.

1. Introduction

Muscovy duck (monogastric animal) is widely available in Laos. This poultry specie does not grow very quickly, its body weight efficiency depends on feed ingredients and feeding models (Meulen et al., 1999). Lao producers are preferred to feed their animal by local ingredients that could be minimized their production costs. Therefore the needs for an alternative feed ingredient resource with good quality for poultry diet has increased. Duckweed (*Lemna spp*), taro (*Alocasia spp*) and water hyacinth (*Echhornia crassipes*) are varied available and booming feed ingredients for monogastric animals in Southeast Asian. Since the nutritive values of duckweed, taro and water hyacinth well known that could be provided sufficient needs of animals (Chhay et al., 2007), and those ingredient utilizations with and without rice bran of the ratio of 1:1 for feeding Muscovy duck was not reported, this mixture ratio could be minimized the feed cost for local farmers and might be improved production performance.

Therefore, this study was conducted to compare effects of duckweed, water hyacinth and taro with and without rice bran on growth performance of Muscovy ducks.

2. Materials and Methods

2.1. Experimental design

This experiment was carried out at the research farm of department of animal science, faculty of agriculture and forest resource (Souphanouvong University). The Completely Randomized Design (CRD) principle was used in a 2*3 factorial arrangement (2 feeding models and 3 ingredients). There were six treatments: 1) Mixed (ratio 1:1) duckweed with rice bran (MDR), 2) Mixed (ratio 1:1) taro silage with rice bran (MTR), 3) Mixed (ratio 1:1) water hyacinth with rice bran (MWR), 4)

Separated duckweed and rice bran (SDR), 5) Separated taro silage and rice bran (STR), and 6) Separated water hyacinth and rice bran (SWR).

2.2. Birds and feeds

A total of seventy two ducklings (526.39 ± 34.39 g/bird) at week 5 of age were purchased from a local producer. Four ducklings per a replicate were randomly distributed into a squarely tiered pen ($1 \text{ m}^2/\text{pen}$) which located at 80 cm of tier's high, to make three replicates per treatment. The trial was carried out for a total of 7 weeks (week 5 to week 11 of duck's age) under the same housing condition.

Duckweed and water hyacinth were fresh fed in chopped forms (0.5cm of length). To avoid ingredients contamination, both duckweed and water hyacinth were prepared daily at the time just before feeding has started. Taro (leaf and stems) was chopped (2cm of length) and sun dried for 24 hours prior making silage. The ensiled taro was contained in plastic bags and stored for 14 days before being fed to the birds. MDR, MTR and MWR were mixed at the ratio of 1:1 (in basis). Both water and feeds were provided *ad libitum* throughout the trail.

2.3. Data collection and analysis

Body weight and feed intake were measured on weekly basis. Mortality was recorded (if any), body weight of dead bird was used for the correction of feed intake.

Triplicate samples of all ground tested ingredients (duckweed, water hyacinth, taro silage and rice bran) samples were subjected to analyze for proximate compositions (Table 1) including dry matter, ash and nitrogen content according to the methods of the AOAC (2005). The moisture contents of tested ingredients were determined in triplicate by drying 1 g per sample in dry oven at $105 \text{ }^\circ\text{C}$ for 5 h. Ash

contents of tested samples were determined in triplicate by burning 1 g per sample in Furnace 62700 at 550 °C for 5 hours. Nitrogen was determined by the nitrogen analyzer (Model 2300 Kjeltac Analyzer Unit, Foss Tecator, Sweden), and CP was calculated using the factor of Nx6.25.

Table 1: Nutritive values of tested ingredients

Ingredients	Nutrient value* (%)		
	DM	CP	Ash
Rice bran	93.3	7.62	5.58
Duck weed	11.2	20.2	3.50
Taro silage	11.5	15.06	6.82
Water Hyacinth	13.8	14	8.89

* DM: Dry meter, CP: Crude protein

2.4. Statistical analysis

All the values were statistically analyzed by Duncan's test using the General Linear Model procedure of SAS program, version 9.1.2 (2004) in a Completely Randomized Design (CRD). Each replicate served as the experimental unit. Differences were considered to be significant at $p < 0.05$. Significant differences between means of treatments were compared.

3. Results

Nutrient compositions of tested ingredients (rice bran, duckweed, taro silage and water hyacinth) are presented in the Table 1. The results of weekly body weights of Muscovy duck are shown in Table 2. Means of live weight of ducks fed MDR and SDR increased significantly ($p < 0.05$) from week 1 to week 7 of the trail period and the values shown highest ($p < 0.05$) body weight compared with the rest treatments. Ducks fed MTR and STR shown relatively lowest ($p < 0.05$) body weight among treatments, and the values of week 1 to week 7 did not improved ($p > 0.05$).

The values of initial body weight, final body weight, total feed intake, daily feed intake, feed conversion ratio (feed/gain) and mortality are shown in Table 3. Muscovy ducks fed MDR and SDR shown highest ($p < 0.05$) values of final body weight. In contrast, lowest ($p < 0.05$) value of final body weight was observed in both MTR and STR groups. Muscovy ducks fed MDR and MTR shown highest ($p < 0.05$) feed consumption, and lowest value of total feed intake was found in SWR group. The best feed

conversion ratio (feed/gain) of the present results was observed in duck fed MDR and SDR. Muscovy duck fed MWR shown poorest ($p < 0.05$) feed/gain. Mortality of birds shown significantly different ($p < 0.05$), mixing rice bran with taro silage by ratio of 1:1 (MTR) caused mortality of birds.

The values of average daily gain are presented in Table 4. Muscovy duck fed MWR in week 1 shown highest ($p < 0.05$) values of daily gain, while lowest value was observed in MTR group. From week 2 to week 3 of the trial period the values of daily gain comparatively did not improved even they were differed significantly ($p < 0.05$). Average daily gain shown significantly different ($p < 0.05$) in every week among treatments, the best daily gain ($p < 0.05$) at week 4 was found in MDR group and lowest in STR group. After week 4, the values of average daily gain are slightly changed in every treatment, while some of them were decreased ($p < 0.05$) in some weeks. However, the values of total and mean of average daily gain differ ($p < 0.05$) among treatments, highest value of average daily gain of both total and mean was observed in MDR group. Poorest average daily gain of both total and mean was found in MTR and STR group.

4. Discussion

The present study shown that growth rate of Muscovy duck is relatively poorer than previous reports (Ngapongora et al., 2004; Etuk et al., 2006). Results of this study shown that low average daily gain might be influenced by average daily feed intake, when computed among treatments; the value of overall daily feed intake was 33.17 g/bird/day. The best value of feed intake of Muscovy duck in this study was observed in the group of bird fed rice bran mixed with duckweed (40.81 g/bird/day). However, this best value still lower than the value that reported by Etuk et al. (2006) who found that feed intake of Muscovy duck with similar age is ranged between 128.54 - 131.14 g/bird/day.

Muscovy duck fed duckweed with (MDR) and without (SDR) rice bran mixture resulted feed conversion ratio (feed/gain) was 5.19 and 4.87, respectively, as indicated the best value in this study (Table 3). Moreover, this result showed that feed/gain was better than the values

Table 2. Live weights (g) of Muscovy duck fed duckweed, water hyacinth and taro silage

Week*	Mixes			Separates			SEM ¹
	MDR	MTR	MWR	SDR	STR	SWR	
1	603.33 ^a	583.33 ^b	664.17 ^a	650.83 ^a	564.17 ^b	584.17 ^b	40.27
2	656.67 ^a	553.33 ^b	636.67 ^a	659.17 ^a	537.50 ^b	595.00 ^{ab}	52.77
3	665.00 ^a	546.67 ^b	648.33 ^a	685.00 ^a	539.17 ^b	601.67 ^{ab}	61.81
4	814.17 ^a	620.83 ^b	728.33 ^{ab}	763.33 ^{ab}	569.17 ^b	692.50 ^{ab}	90.85
5	870.00 ^a	605.00 ^{ab}	753.33 ^a	800.00 ^a	560.83 ^b	696.67 ^{ab}	117.41
6	853.33 ^a	577.50 ^c	733.33 ^{ab}	763.33 ^a	554.17 ^c	700.00 ^{ab}	113.88
7	878.33 ^a	580.00 ^c	780.00 ^{ab}	828.33 ^a	560.00 ^c	716.67 ^{ab}	130.79

¹ SEM: Standard error of mean (n = 18).

^{a,b,c} Means with different superscripts within the same row differ (p<0.05).

* MDR: Mixed (ratio 1:1) duckweed with rice bran, MTR: Mixed (ratio 1:1) taro silage with rice bran, MWR: Mixed (ratio 1:1) water hyacinth with rice bran, SDR: Separated duckweed and rice bran, STR: Separated taro silage and rice bran, and SWR: Separated water hyacinth and rice bran.

Table 3. Growth performance of Muscovy duck fed duckweed, water hyacinth and taro silage

Week*	Mixes			Separates			SEM ¹
	MDR	MTR	MWR	SDR	STR	SWR	
Initial BW (g/duck)	507.08	569.17	516.39	591.25	514.58	553.13	34.39
Final BW (g/duck)	878.33 ^a	580.00 ^c	780.00 ^{ab}	828.33 ^a	560.00 ^c	716.69 ^{ab}	130.79
Total FI (g/duck)	1999.68 ^a	1888.00 ^a	1553.59 ^c	1609.44 ^b	1578.48 ^c	1122.52 ^d	306.45
Daily FI (g/duck/day)	40.81 ^a	38.53 ^a	31.71 ^b	32.85 ^b	32.21 ^b	22.91 ^c	6.25
Feed/Gain (g/g)	5.19 ^a	7.30 ^b	22.14 ^c	4.87 ^a	8.10 ^b	9.17 ^b	6.43
Mortality (%)	0.00 ^b	8.33 ^a	0.00 ^b	0.00 ^b	0.00 ^b	0.00 ^b	3.40

¹ SEM: Standard error of mean (n = 18).

^{a,b,c,d} Means with different superscripts within the same row differ (p<0.05).

* BW: body weight, FI: feed intake, MDR: Mixed (ratio 1:1) duckweed with rice bran, MTR: Mixed (ratio 1:1) taro silage with rice bran, MWR: Mixed (ratio 1:1) water hyacinth with rice bran, SDR: Separated duckweed and rice bran, STR: Separated taro silage and rice bran, and SWR: Separated water hyacinth and rice bran.

Table 4. Average daily gain (g) of Muscovy duck fed duckweed, water hyacinth and taro silage (week 1-7 of the trial periods)

Week*	Mixes			Separates			SEM ¹
	MDR	MTR	MWR	SDR	STR	SWR	
1	13.75 ^b	2.02 ^c	21.11 ^a	8.51 ^b	7.08 ^b	4.43 ^c	6.95
2	7.62 ^a	-4.29 ^c	-3.93 ^c	1.19 ^b	-3.81 ^c	1.55 ^b	4.68
3	1.19 ^b	-0.95 ^c	1.67 ^b	3.69 ^a	0.24 ^c	0.95 ^b	1.20
4	21.31 ^a	10.59 ^b	11.43 ^b	11.19 ^b	4.29 ^c	12.98 ^b	5.48
5	7.98 ^a	-2.26 ^c	3.57 ^b	5.24 ^a	-1.19 ^c	0.60 ^c	2.93
6	-2.38 ^c	-3.93 ^c	-2.86 ^c	-5.24 ^d	-0.95 ^b	0.48 ^a	2.05
7	3.57 ^c	0.36 ^d	6.67 ^b	9.29 ^a	0.83 ^d	2.38 ^c	3.10
Total	53.04 ^a	1.55 ^d	37.66 ^b	33.87 ^b	6.49 ^d	23.36 ^c	19.57
Mean	7.58 ^a	0.22 ^d	5.38 ^b	4.84 ^c	0.93 ^d	3.34 ^c	2.80

¹ SEM: Standard error of mean (n = 18).

^{a,b,c,d} Means with different superscripts within the same row differ (p<0.05).

* MDR: Mixed (ratio 1:1) duckweed with rice bran, MTR: Mixed (ratio 1:1) taro silage with rice bran, MWR: Mixed (ratio 1:1) water hyacinth with rice bran, SDR: Separated duckweed and rice bran, STR: Separated taro silage and rice bran, and SWR: Separated water hyacinth and rice bran.

that reported by Etuk et al. (2006). These authors cited that feed conversion ratio (feed/gain) of Muscovy duck was ranged between: 11.44 - 12.16, which about above 100% poorer than that result of MDR and SDR.

Average daily gain in this study was 3.71 g/bird/day, and the best value was 7.58 g/bird/day. However, the highest value of average daily gain in this study is still poorer than that of other reports (Etuk et al., 2006; Ngapongora et al., 2004). The variability in growth rate of Muscovy duck depends on fed, male and female are also varied significant difference (Nwachukwu, 1998; Ola, 2000; Meulen at al., 1999). Since, this result did not defined body weight gain for male and female separately, but its variability in growth between male and female were showed about 37% increased in body weight gain of male over female (Etuk et al., 2006).

5. Conclusion

This study shown that growth performance of Muscovy duck fed duckweed, taro silage and water hyacinth that with and without rice bran mixtures were statistically different. Mixed rice bran with duckweed shown positive effect on production performance of Muscovy duck, and this feeding trial could be useful as a good model for local farmers in terms of the availability and low cost of tested ingredients. However, specifics nutrient composition of tested ingredients, which met the needs of duck, should be well defined for further research. To maximize growth rate of Muscovy duck, its nutrient requirements should be concerned as a first priority to meet welfare animal productions.

6. Acknowledgement

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