

## **The effect of exogenous enzymes (amylase-protease-xylanase combination) on performance, liver and carcass characteristics of mule ducks.**

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### *Abstract*

A study was conducted to evaluate the effect of an amylase-protease-xylanase combination (XAP) on performance, liver (*foie gras*) and carcass characteristics of mule ducks. 540 day-old Mule ducks were assigned to 2 treatments of 6 pen-replicates each, with 45 ducks per pen for 12 weeks. They were fed a corn-based diet without (T1) or with (T2) 1g XAP/kg feed. Then 125 ducks from each treatment were individually fed (*gavage*) for 12.5 days with corn wet mash. T2 contained 2g XAP/kg corn. XAP addition significantly increased feed intake and live weight at 4 weeks of age. At 12 weeks of age ducks fed XAP diets were 60g heavier than control (P=0.06). Body weight uniformity was improved during the whole growing period. Breast yield was numerically improved by 2%. XAP addition during *gavage* improved *foie gras* weight by 5.5% to 612 g due to improved corn digestibility: 59.8 g *foie gras* per kg corn with XAP vs. 57 g for control. Boneless breast (*magret*) was heavier by 15g (3%), thighs by 10g (2%) and wings by 10g (4%) (all NS).

## **Introduction**

Exogenous enzymes have been widely used in poultry nutrition, especially in wheat & barley-based diets, to reduce digesta viscosity, improve nutrient digestibility, performance, flock uniformity and litter quality. Corn nutritional value, perceived by many as more uniform, has been shown to vary considerably from batch to batch (D'Alfonso and Cracken, 2002). Starch content, its type and digestibility, starch-protein binding, oil, fibre and phytate levels may all be responsible for much of this variation (Carre 2004, Cowieson, 2004). Supplementation of corn/soy diets with exogenous enzymes can result in improved broiler and layer performance (Pack and Bedford, 1997; Castaing and Larroude, 1999, 2001; Zanella *et al*, 1999) and in Pekin ducks (Hong *et al*, 2002). Mule ducks are grown for the production of *foie gras* (liver) and *magret* (breast). This study aimed to evaluate the effect of exogenous enzymes (mixture of amylase, protease and xylanase) in corn-based diets fed to Mule ducks during rearing and individual feeding (*gavage*) periods.

### *Materials and Methods*

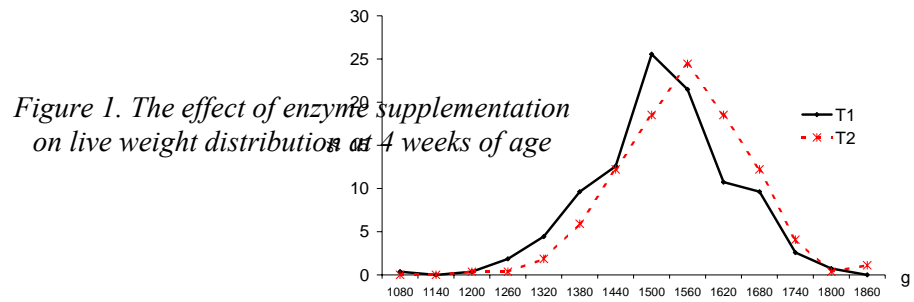
540 one-day-old mixed sex Mule ducks were allocated to two treatments (T1: control and T2: experimental treatment) of 6 replicates per treatment, with 45 ducks per pen/replicate. Two stages: up to 12 weeks of age: rearing period (RP), then *gavage* (GP) for 12.5 days. During the rearing period, ducks were fed a pelleted starter diet (175g crude protein (CP) and 2830 Kcal ME/kg), *ad libitum* up to 4 weeks, and a pelleted grower feed (135g CP and 2900 Kcal ME/kg) *ad libitum* from 4 to 10 weeks of age. During the last 2 weeks before GP, ducks were given the feed *ad libitum* but restricted at 1 hour/day. An enzyme combination, constituted of amylase, protease and xylanase (XAP, Avizyme® 1500, Danisco Animal Nutrition), was incorporated into the diets (55% corn) of T2 at 1g/kg. At the end of the rearing period, 125 ducks from each treatment were fed (*gavage*) in individual cages, during 12.5 days, with total of 25 meals. During GP, XAP combination was incorporated at 2g/kg into the corn wet mash of T2. Feed consumption was measured weekly in each pen during RP and per meal and per duck during GP. Ducks were individually weighted at 4, 8, 10 and 12 weeks of age and carcass characteristics of 15 ducks per treatment were measured at the end of RP and at the end of GP. The *foie gras* performance was evaluated in all the ducks.

### *Results and Discussion*

#### 1. Rearing period

XAP addition increased both feed consumption and growth especially during the starter period. At 4 weeks of age, feed consumption with XAP was 3.4% higher vs. control (3.04 kg vs. 2.94 kg, P<0.05);

live weight (LW) was increased by 2.6% (1.55 kg vs. 1.51 kg,  $P<0.05$ ) with a better uniformity (CV 7.3% vs. 6.7%) (Figure 1), FCR was 1.96 vs. 1.95, very small but significant difference ( $P<0.05$ ).



XAP addition resulted in a numerically better performance in grower period. At 12 weeks of age, the ducks fed diets + XAP had an average live weight of 4.52 kg vs. 4.46 kg for the control treatment ( $P=0.06$ ) without difference in FCR (Table 1).

*Table 1. Performance results*

XAP	0	1kg/t	CV	P value
<b>At 4 weeks of age</b>				
Feed Intake, Kg	2.94	3.04	1.9	<0.05
Live weight, Kg	1.51	<b>1.55</b>	1.7	<0.05
FCR	1.95	1.96	0.5	<0.05
<b>At 8 weeks of age</b>				
Feed Intake, Kg	9.57	9.67	1.2	0.12
Live weight, Kg	3.53	<b>3.59</b>	1.2	0.06
FCR	2.71	2.70	0.7	NS
<b>At 12 weeks of age</b>				
Feed Intake, Kg	16.81	16.98	0.6	<0.05
Live weight, Kg	4.46	<b>4.52</b>	0.9	0.06
FCR	3.77	3.76	0.7	NS

Feathering came earlier, suggesting improved sulphur amino acid digestibility (especially cysteine). Breast weight at 12 weeks of age was higher for ducks fed T2 by 2%. (365g vs. 358g; NS).

### 2. Gavage period

The ducks were fed for 12.5 days (25 meals). The average intake per duck was of 10.24 kg for T2 vs. 10.05 kg for T1 (+2%). There were less dose-adjustments when XAP was added into the corn wet mash (Figure 2).

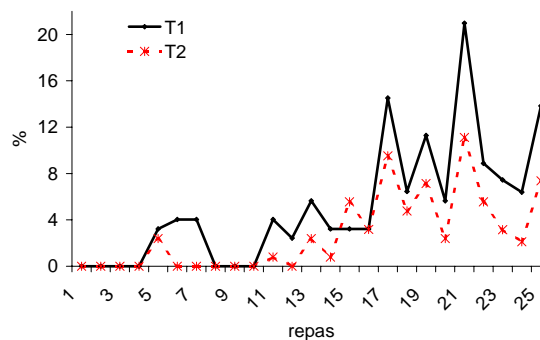


Figure 2. Dose-adjustments in ducks % per meal

**Meal**

The average performance in *foie gras* was good, with a mean liver weight of 596g (Table 2). XAP supplementation improved liver weight significantly ( $P<0.05$ ) by 5.5 % to 612g vs. 580g for control.

Table 2. Gavage performance

	T1	T2	% improvement	SD	P value
Duck weight, Kg	4.46	4.53	1.6	0.41	0.28
Corn intake, kg/duck	10.05	10.24	1.9	0.62	<0.05
Foie gras, g	580	612	<b>5.5</b>	87	<0.05
Foie gras g/kg corn	57	59.8	<b>5</b>	8.2	<0.05

Corn use efficiency during the *gavage* period was increased by 5%: 59.8 g of *foie gras* per kg corn vs. 57 g for the control treatment. The results showed the same difference in duck LW at the end of the rearing period and in eviscerated ducks (+60g). There were not any significant differences in carcass composition, but *magret* was heavier by 15g (3%), thighs by 10g (2%) and wings by 10g (4%).

Table 3. Carcass characteristics

	T1	T2	% improvement	SD	P value
XAP	0	1kg/t			
Eviscerated carcass, Kg	3.93	3.98	1.3	0.31	NS
<b>Wings, g</b>	236	<b>246</b>	4.2	24	0.25
<b>Magrets, g</b>	480	<b>495</b>	3.1	37	0.27
Filet, g	278	284	2.2	23	NS
Skin + fat, g	201	210	4.5	24	0.29
<b>Thighs, g</b>	544	<b>554</b>	1.8	52	NS
Thigh muscle + bone, g	262	272	3.8	24	0.25
Skin + fat, g	281	281	-	34	NS

The performance of Mule ducks fed the control diet was considered as good throughout the trial. Nevertheless, XAP combination was able to further improve performance (especially during the first 4 weeks when endogenous enzyme production is low, affecting nutrient digestibility), and live weight uniformity. At 12 weeks of age, mean LW was increased by 60g (4.52kg vs. 4.46kg). Feathering came earlier and there was a tendency for a higher breast yield in T2. Such performance improvements were previously observed in broilers and Pekin ducks at 42 days of age (Hong *et al* 2002). During the *gavage*, ducks are fed only corn (98.5%). Adding XAP, during the whole rearing & *gavage* periods, significantly increased *foie gras* weight by 5.5 % (612g vs. 580g). This improvement was partly due to a slight increase in corn intake, but mainly due to an improvement in corn nutrient digestibility. This supports previous results regarding higher corn starch digestibility in broilers fed diets supplemented with mixture of xylanase, amylase and protease (D'Alfonso, 2003). Moreover, supplementation of poultry diets with exogenous enzymes can contribute to reduction in microbial load in the distal gut (Apajalahti and Bedford, 1999) of poultry. Microbial evaluation of caecal samples from this study will be conducted and reported at later stage.

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