PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (7): 1036-1039, 2009
ISSN 1680-5194

Effect of Dietary Inclusion of Cassava Yeast as Probiotic Source on Growth Performance and Carcass Percentage in Japanese Quails

Songsak Chumpawadee, Orawan Chinrasri and Suwannee Santaweesuk
Animal Feed Resource and Animal Nutrition Research Unit, Division of Animal Science,
Faculty of Veterinary and Animal Sciences, Mahasarakham University,
Maung, Mahasarakham, 44000 Thailand

Abstract: Use of antibiotics as an additive in poultry diets to improve growth has been banned in several country. A popular alternative to the use of antibiotics has been use of probiotics. The study was conducted to investigate the effect of dietary inclusion of cassava yeast as a probiotic source on growth performance and carcass percentage in Japanese quails. Three hundred and twenty Japanese quails (1 day of age), were used. The Japanese quails were randomly allocated to 32 pens containing 10 birds each with 8 replicates and assigned to receive one of four dietary treatments (1.Control, 2. *S. cerevisae* $1x10^6$ organisms/kg, 3. *S. cerevisiae* $1x10^7$ organisms/kg, 4. *S. cerevisiae* $1x10^8$ organisms/kg) in a completely randomized design. The results showed that feed intake, feed conversion ratio, average daily gain and carcass percentage were not significantly different among treatments ($p>0.05$). However, significant differences were observed in feed intake at weeks 5 and average daily gain at week 2. The results of the present experiment showed that dietary inclusion of cassava yeast as a probiotic to Japanese quail seems to have minimal influence on growth performance and carcass percentage.

Key words: Probiotic, cassava yeast, growth performance, Japanese quails

INTRODUCTION

The use of antibiotics for growth promotion in poultry species has been banned in Europe and United states (Ahmad, 2006). Therefore, nutritionists and production managers are interested in compounds that may serve as possible replacements. Probiotics are one of the approaches that have a potential to replace antibiotics. Probiotics are live microorganisms that, when administered through the digestive tract, has a positive impact on the host's health and production. Generally, probiotics are derived bacteria, fungi and yeast. *Saccharomyces cerevisiae*, one of the most widely commercialized types of yeast, has long been fed to animals. Live yeast addition to animal feed has been known to improve the nutritive quality of feed and performance of animals (Martin *et al*., 1989). In addition, mannan oligosaccharides and fructo oligosaccharide derived from the cell wall of the yeast *S. cerevisiae*, has shown promise in suppressing enteric pathogens, and modulating the immune in studies with poultry (Santin *et al*., 2001; Spring *et al*., 2000; Iji *et al*., 2001). Additionally, there are trials showing that enrichment of diets with yeast could favorably improve the feed efficiency (Day, 1997), growth rate (Ghasemi *et al*., 2006) and carcass percentage (Vargas *et al*., 2002).

Cassava yeast is a naturally produced live yeast culture of *S. cerevisiae* together with its growth medium of cassava, soybean meal, sugar cane molasses, urea, $MgSO_4$ $2H_2O$, KH_2PO_4 and citric acid. Cassava yeast are composed of natural concentrate mixture of essential nutrients, live cell of yeast, mannan oligosaccharide derived from cell wall of dead cell and vitamin B-complex. This work therefore, has the objective of evaluating the supplemental effect of cassava yeast (*S. cerevisiae* plus the growth medium) on growth performance and carcass percentage in Japanese quails.

MATERIALS AND METHODS

Preparation of cassava yeast: Cassava chip and soybean meal were grounded using hammer mill, and the both flour were subjected to fermentation. Pure strain of *S. cerivisae* was sub-cultured into 730 mL nutrient solution [yeast (5 g), sugar cane molasses (24 g), urea (10 g), $MgSO_4$ $2H_2O$ (7 g), KH_2PO_4 (13 g) and citric acid (20 g)] and inoculated into 1 kg of flour [cassava (900 g) and soybean meal (100 g) and then allowed to ferment for 15 h. The product obtained was subsequently dry at room temperature. Therefore, cassava yeast is composed of yeast (*S. cerevisiae*) and medium on which it was grown. Dried cassava yeast sample was analyzed in laboratory chemically for proximate constituents (AOAC, 1990). Viable cell counts on product were estimated using the methylene blue staining method (Lindgren, 1949). This product is containing, dry matter 88.28%, ash 8.69%, crude protein 9.94%, crude fiber 5.61%, ether extract 0.42%, nitrogen free extract 75.34% and living cell of yeast 1.23×10^6 organisms/g.

Experimental birds: A total of 320 one day old Japanese quails, having 9.5 g initial body weight, were randomly divided into 32 separate pens (each 50x60 cm) each comprising 10 birds and eight pens (replicates) per treatment group following completely randomized design. The experimental house was thoroughly cleaned and disinfected before the arrival of birds. Experimental birds were maintained under standard management conditions for 35 days. The experimental birds were fed *ad libitum*. The birds had free access to feed and clean drinking water. All birds were vaccinated against Newcastle disease and infectious bronchitis disease.

Experimental diets: Four isonitrogenous and isocaloric diets in the form of mash were prepared to meet the requirement (National Research Council, 1994). The different of cassava yeast such as 0, 0.08, 0.8 and 8.1% were used in diets (Table 1) fed to experimental groups T_1, T_2, T_3 and T_4, respectively. The control diets had no *S. cerevisiae* while diets T_2, T_3 and T_4 contained *S. cerevisiae* at $1x10^6$, $1x10^7$, $1x10^8$ organisms/kg. Rice bran, yellow maize, vegetable oil, fishmeal and soybean meal served as main energy and protein sources. Each diet was analyzed as described methods in AOAC (1990).

Table 1: Ingredients and chemical composition (%) of Japanese quail diets different levels of cassava yeast

	Diets*			
Ingredients	T_1	T_2	T_3	T_4
Rice bran	14.00	14.00	13.00	7.38
Yellow maize	39.00	39.00	39.20	37.00
Vegetable oil	2.00	2.00	2.00	2.00
Soybean meal (42 %CP)	36.00	36.00	36.00	36.50
Fish meal (60 %CP)	7.00	7.00	7.00	7.00
Cassava yeast	0.00	0.08	0.81	8.13
Dicalcium phosphate	0.50	0.50	0.50	0.50
Limestone	0.50	0.50	0.50	0.50
Salt (NaCl)	0.25	0.25	0.25	0.25
Premix	0.50	0.50	0.50	0.50
DL-Methionine	0.25	0.25	0.25	0.25
Chemical composition				
Dry matter, (%)	95.28	96.59	95.75	94.84
Ash, (%)	8.01	7.17	7.96	8.40
Crude protein, (%)	27.07	27.78	27.65	27.49
Crude fiber, (%)	2.59	2.16	1.72	1.83
Ether extract, (%)	2.26	4.05	3.18	7.08
Calcium, (%)	0.60	0.77	0.75	0.70
Phosphorus, (%)	0.97	0.77	1.16	1.03
Lysine#, (%)	1.50	1.06	1.06	1.04
Methionine and Cystine#, (%)	1.06	1.59	1.59	1.59
Tryptophan#, (%)	0.30	0.30	0.30	0.30
Threonine#, (%)	0.97	0.97	0.96	0.96
Metabolizable energy, kcal/kg#	2,900.00	2,900.00	2,900.00	2,900.00

* T_1: 0% cassava yeast, T_2: 0.08 % cassava yeast, *S. cerevisiae* $1x10^6$ organisms/kg, T_3: 0.8 % cassava yeast, *S. cerevisiae* $1x10^7$ organisms/kg, T_4: 8.1 % cassava yeast, *S. cerevisiae* $1x10^8$ organisms/kg, # calculated values

Parameter measured: Body weight gain and feed intake per pen were recorded at weekly intervals. The efficiency of feed utilization was calculated as feed intake per unit body weigh gain. At the termination of the experiment, six birds from each replicate were randomly selected, slaughtered and eviscerated to record weight of carcass and calculate carcass percentage.

Statistical analyses: All data obtained from the trials were subjected to the analysis of variance procedure of statistical analysis system (SAS, 1996) according to a completely randomized design. Means were separated by Duncan New's Multiple Range Test. The level of significance was determined at $p<0.05$.

RESULTS

The feed ingredients used in the experiment and chemical composition of dietary treatment are shown in Table 1. The ingredients of all treatments were the same, but different in levels of cassava yeast. All treatments had a similar chemical composition.

The effects of cassava yeast level on feed intake, feed conversion ratio, average dairy gain and carcass percentage are presented in Table 2. During week 5 feed intake were significantly ($p<0.05$) affected by cassava yeast level. Comparatively higher feed intake was observed in Japanese quail fed diet with *S. cerevisiae* $1x10^8$ organisms/kg compared to other diets. However, average feed intake was not significant different ($p>0.05$) among treatments. The results show that dietary inclusion of cassava yeast did not affect ($p>0.05$) the feed conversion ratio and carcass percentage. The average daily gain of Japanese quails fed the diet with different levels of cassava yeast was not significant difference on week 1, 3, 4 and 5. However, average daily gain during accelerated periods (week 2) was significant different among treatment ($p<0.05$).

DISCUSSION

The data indicated that there were no significant difference ($p>0.05$) in feed intake (except week 5) and feed conversion ratio. The results are in agreement with previous studies in laying hens (Mohiti Asli *et al*., 2007; Ayanwale *et al*., 2006; Yousefi and Karkoodi, 2007; Chumpawadee *et al*., 2009) and broilers (Chumpawadee *et al*., 2008; Karaoglu and Durdag, 2005) that observed feed intake was not affected by yeast inclusion the diet. Additionally, feed conversion ratio was not significant different among treatment. These results are in agreement with those of Ergun *et al*. (2000); Mutus *et al*. (2006) who reported that the supplement of a probiotic did not have any effect on feed conversion ratio. Yousefi and Karkoodi (2007) also reported that feed conversion ratio was not affected by the dietary probiotic and yeast supplementation. In addition Chumpawadee *et al*. (2008) could not detect

Table 2: Growth performances and carcass percentage of Japanese quail fed diets containing different levels of cassava yeast

	Diets*				
Criteria	T_1	T_2	T_3	T_4	SEM
Initial body weight, g	9.52	9.52	9.53	9.52	-
Final body weight, g	166.04	164.00	157.29	162.11	-
Feed intake, g/d					
Week 1	4.97	5.14	5.00	4.90	0.06
Week 2	10.47	10.80	10.14	10.64	0.15
Week 3	10.84	10.78	10.46	10.26	0.11
Week 4	12.50	12.66	12.27	12.44	0.08
Week 5	20.22^{b}	20.81^{ab}	19.40^{b}	21.94^{a}	0.31
Average	12.27	12.92	12.10	12.37	0.14
Feed conversion ratio					
Week 1	1.76	1.77	1.69	1.79	0.05
Week 2	1.80	1.85	1.89	1.89	0.03
Week 3	2.66	2.65	2.28	2.51	0.07
Week 4	2.25	2.38	2.59	2.36	0.07
Week5	5.61	5.69	5.83	5.88	0.34
Avera ge	2.74	2.93	2.88	2.83	0.03
Average daily gain, g/d					
Week 1	2.87	2.92	3.06	2.79	0.07
Week 2	5.82^{a}	5.85^{a}	5.34^{b}	5.63^{ab}	0.08
Week 3	4.21	4.14	4.59	4.10	0.10
Week 4	5.63	5.49	4.87	5.40	0.17
Week 5	3.81	3.65	3.22	3.85	0.18
Average	4.47	4.41	4.22	4.36	0.05
Carcass percentage	77.56	75.53	76.85	77.26	0.47

T_1: 0% cassava yeast, T_2: 0.08% cassava yeast, *S. cerevisiae* $1x10^6$ organisms/kg, T_3: 0.8% cassava yeast, *S. cerevisiae* $1x10^7$ organisms/kg, T_4: 8.1% cassava yeast, *S. cerevisiae* $1x10^8$ organisms/kg

any difference in the feed conversion ratio of the broilers as compared to the control. Some studies show that probiotics supplementation in the feed of chickens improve the feed conversion ratio (Day, 1997). The reason for the variable effect of biological additives may be confounded by variations in gut flora and environmental condition (Mahdavi *et al*., 2005).

The data indicated that there was no significant difference ($p>0.05$) in average daily gain (except week 2). These results are in agreement with Ayanwale *et al*. (2006) who found that yeast (*S. cerevisiae*) supplementation in the diets of pullets did not have any effect of body weight gain. Chumpawadee *et al*. (2008) observed supplementation of cassava yeast to broiler diets did not improve growth rate. However, Santin *et al*. (2001) found that supplementation of feed with *S. cerevisiae* cell wall (0.2%) improved broiler body weight. In contrast, supplementation of feed with *S. cerevisiae* fermented cassava flour had negative effect on the body weight of albino rat (Oboh and Akindahunsi, 2005). But, there are also some reports which disagree with this findings (Ghasemi *et al*., 2006), the broiler fed the diet supplement *S. cerevisiae* Sc47 improved body weight gain compared with an unsupplemented diet. The reason of variation might be related to the strain of yeast, concentration and form of yeast used.

The effect of cassava yeast on carcass percentage was no significant difference ($p>0.05$). These results are in agreement with Karaoglu and Durdag (2005) who found that yeast (*S. cerevisiae*) supplementation in the diets of broiler did not have any effect on hot carcass and cold carcass percentage. Chumpawadee *et al*. (2008) also reported that inclusion of cassava yeast in boiler diet did not have any effect on carcass, wing, breast, liver and gizzard percentage ($p>0.05$). Other researchers found differences in carcass yield between birds that were fed probiotic and those not fed (Ghasemi *et al*., 2006; Pelicano *et al*., 2003).

Conclusions: The results of present study showed that dietary inclusion of cassava yeast as probiotic source have no beneficial effect on growth performance and carcass percentage of Japanese quails. Probiotic supplement of Japanese quails maybe more helpful during periods of nutritional and other stress, but under normal environmental and management condition it seems to have minimal influence on performance and carcass percentage.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the Division of Animal Science, Faculty of Veterinary and Animal Science, Mahasarakham University for supporting experimental facilities. This study was supported by grant from Mahasarakham University fiscal year 2007.

REFERENCES

Ahmad, I., 2006. Effect of probiotics on broilers performance. Int. Poult. Sci., 5: 593-597.

AOAC., 1990. Official Methods of Analysis, 15th Edition. Association of Official Analytical Chemists, Arlington, Virginia, USA.

Ayanwale, B.A., M. Kpe and V.A. Ayanwale. 2006. The effect of supplementing *Saccharomyces cerevisiae* in the diets on egg laying and egg quality characteristics of pullets. Int. Poult. Sci., 5: 759-763.

Chumpawadee, S., A. Chantiratikul and S. Santaweesuk, 2009. Effect of dietary inclusion of cassava yeast as probiotic source on egg production and egg quality of laying hens. Int. J. Poult. Sci., 8: 195-199.

Chumpawadee, S., O. Chinrasri, T. Somchan, S. Ngamlaun and S. Soychuta, 2008. Effect of dietary inclusion of cassava yeast as probiotic source on growth performance, small intestine (ileum) morphology and carcass characteristic in broilers. Int. J. Poult. Sci., 7: 246-250.

Day, E.J., 1997. Effect of yeast culture on tibia bone in three week old broiler chickens fed graded level of inorganic phosphorus. Res. Bull. Missisipi State University Stark Villiams.

Ergun, A., S. Yalcin and P. Sacakli, 2000. The usage of probiotic and zinc bacitracin in broiler rations. Ankara Universitesi Veteriner Fakultesi Dergisi, 47: 271-280.

Ghasemi, H.A., A.M. Tahmasbi, G.H. Moghaddam, M. Mehri, S. Alijani E. Kashefi and A. Fasifi, 2006. The effect of phytase and *Saccharomyces cerevisiae* (SC47) supplementation on performance serum parameters, phosphorous and calcium retention of broiler chickens. Int. Poult. Sci., 5: 162-168.

Iji, P.A., A.A. Saki and D.R. Tivey, 2001. Intestinal structure and function of broiler chickens on diets supplemented with a mannan oligosaccharide. J. Sci. Food Agric., 81: 1186-1192.

Karaoglu, M. and H. Durdag, 2005. The influence of dietary probiotic *Saccharomyces cerevisiae* supplementation and different slaughter age on the performance, slaughter and carcass properties of broilers. Int. Poult. Sci., 4: 309-316.

Lindgren, C.C., 1949. The Yeast Cell. Its Genetics and Cytology. Education Publishers, St. Louis, MO.

Mahdavi, A.H., H.R. Rahmani and J. Pourreza, 2005. Effect of probiotic supplements on egg quality and laying hen's performance. Int. Poult. Sci., 4: 488-492.

Martin, S.A., D.J. Nisbet and R.G. Dean, 1989. Influence of commercial yeast supplement on the ruminal fermentation. Nutr. Rep. Int., 40: 395-401.

Mohiti, Asli, M., S.A. Hosseini, H. Ltfollahian and F. Shariatmadari, 2007. Effect of probiotics, yeast, vitamin C supplements on performance and immune response of laying hen during high environmental temperature. Int. J. Poul. Sci., 6: 895-900.

Mutus, L., N. Kocabagli, M. Aip, N. Acar, M. Eren and S. Gezen, 2006. The effect of dietary probiotic supplementation on tibial bone characteristics and strength in broilers. Poult. Sci., 85: 1621-1625.

National Research Council, 1994. Nutrient Requirements of Poultry. 9th Edn. National Academy Press. Washington, DC., USA.

Oboh, G. and A.A. Akindahunsi, 2005. Nutritional and toxicological evaluation of *Saccharamyces cerevisiae* fermented cassava flour. J. Food Com. Analysis, 18: 731-738.

Pelicano, E.R.L., P.A. Souza, H.B.A. Souza, A. Oba, E.A. Nokus, L.M. Kodawara and T.M.A. Lima, 2003. Effect of difference probiotics on broiler carcass and meat quality. Rev. Bras. Cienc. Avic., 5: 207-214.

Santin, E., A. Maiorka, M. Macari, M. Grecco, J.C. Sanchez, T.M.Okada and A.M. Myasaka, 2001. Performance and intestinal mucosa development of broiler chickens fed diets containing *Saccharomyces cerevisiae* cell wall. J. Applied Poult. Res., 10: 236-244.

SAS,1996. SAS User's Guide: Statistics, Version 6.12th Edn. SAS Institute Inc. Cary, NC.

Spring, P., C. Wenk, K.A. Dawson and K.E. Newman, 2000. The effects of dietary mannan oligosaccharides on cecal parameter and the concentrations of enteric bacteria in the ceca of Salmonella challenged broiler chicks. Poult. Sci., 79: 205-211.

Vargas, J.G., R.S. Toledo, L.F.T. Albino, H.S. Rostango, J.E. Oliveiva and D.C.O. Carvalho, 2002. Characteristic as de frang de carte, submetidos a racoes contendo probioticos, prebioticos e antibioticos. In: XXXIXI da SBZ, 2002, Recife. ANais and Recife 2002, CD Rom.

Yousefi, M. and K. Karkoodi, 2007. Effect of probiotic thepax and *Saccharomyces cerevisiae* supplementation on performance and egg quality of laying hens. Int. J. Poult. Sci., 6: 52-54.