World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 6.129

EFFECT OF FERMENTED DRAGON FRUIT SKIN JUICE THROUGH DRINKING WATER ON QUAIL EGG PRODUCTION

Ningsih N. W. A.[1*], G. A. M. K. Dewi[2], E. Puspani[2], NW. Siti[2] and I. G. N. G. Bidura[2]

[1]Magister Program of Animal Science, Faculty of Animal Husbandry, Udayana University, Denpasar-Bali, Indonesia.
[2]Faculty of Animal Husbandry, Udayana University, Denpasar-Bali, Indonesia.

***Corresponding Author: Ningsih N. W. A.**
Magister Program of Animal Science, Faculty of Animal Husbandry, Udayana University, Denpasar-Bali, Indonesia.

Article Received on 05/10/2022 **Article Revised on 26/10/2022** **Article Accepted on 16/11/2022**

ABSTRACT

This study aims to determine the productivity of quail aged 7-15 weeks given fermented dragon fruit peel juice (FDJ) through drinking water. The design used was a completely randomized design consisting of 3 treatments and 6 replications where each replication consisted of 60 quails. The treatments were drinking water without fermented dragon fruit peel juice (P1), drinking water plus 4% fermented dragon fruit peel juice (P2) and drinking water plus 6% fermented dragon fruit peel juice (P3). The results showed that the addition of fermented dragon fruit peel juice 4% (P2) and 6% (P3) had a significant effect ($P \leq 0.05$) on final body weight, carcass weight, daily egg production, and the number of intestinal lactic acid bacteria, but not significantly different ($P \geq 0.05$) in nutrient digestibility, growth, feed efficiency, and egg weight. Based on the results of the study, it can be concluded that the addition of fermented dragon fruit peel juice 4% and 6% in drinking water can increase growth, carcass weight, daily egg production, and the number of intestinal lactic acid bacteria, but has not affected nutrient digestibility, growth, feed efficiency, and egg weight.

KEYWORDS: dragon fruit peel extract, feed efficiency, quail.

INTRODUCTION

Quail is one of the poultry as producers of eggs and meat, the presence of quail can support the availability of cheap and easily available animal protein.[1] In early 2018, the use of Antibiotic Growth Promoter (AGP) was banned in Indonesia, based on the Indonesian Livestock and Health Law Number 41 of 2014, which states that everyone is prohibited from using feed ingredients mixed with certain hormones or antibiotics as supplements. One of the ingredients that has been widely studied as a substitute for antibiotics is the bioactive found in nutritious plants. Dragon fruit plant is a new plant cultivated in Indonesia around 2000[2], Red dragon fruit peel (*Hylocereus polyrhizuz*) which is agricultural waste has not been widely used by people in Indonesia. Dragon fruit peel has antioxidants that function to prevent cell damage by free radicals and counteract stress in poultry against environmental conditions.[3] Daniel et al.[4] stated that dragon fruit peel has a high crude fiber content of 23.39%, this is a limiting factor as a component of poultry feed. Therefore, Bidura[5] recommends herbal leaves that are high in fiber content, so their use can be through water extract or juice, because fiber is not soluble in water. Pamungkas[6] stated that the high crude fiber content and low protein content in local waste feed ingredients which are one of the obstacles in their utilization can be overcome by fermentation. The benefits of fermentation are that it can convert complex organic matter into simpler and easier-to-digest molecules and change the taste and aroma that is not liked to be liked.[7]

Several researchers[5,8,9,10,11,12,13,14,15] reported that the inclusion of herbal juices in drinking water poultry, can significantly increase growth, egg production, and feed efficiency, on the other hand, significantly reduce cholesterol and fat levels in the body.

Based on this description, it is necessary to conduct research to improve the quality of dragon fruit skin through the fermentation process, and the effect of the inclusion of fermented juice in drinking water on the productivity of quail aged 7-15 weeks.

MATERIAL AND METHODS

Animal treatments and experimental design.

The quail used was quail type *Coturnix coturnix japonica* aged 7 weeks with a homogeneous body weight of 180 birds. The 180 quails were randomly assigned to three treatment groups, namely: group P1: quail given

drinking water without fermented dragon skin fruit juice (FDJ) as a control; group P2: drinking water including 4% FDJ; and group P3: drinking water including 6% FDJ. The ration used was a commercial ration QQ 504S for quail aged 7 weeks and over produced by PT. Sreeya Sewu Indonesia Tbk. The drinking water used was sourced from PDAM. The equipment used was a colony cage consisting of 18 units with a length of 70 cm, a height of 20 cm, and a width of 50 cm, a feed and drink container, a digital scale, an egg tray, a micrometer screw, a caliper, a yolk color fan, and a glass table.

Table 1: Nutrient content in QQ 504S commercial feed.

Nutrient Contents	Composition[1]	Standar[2]
Water content, %	14.0	14.0
Crude protein, %	21.0	20-22
Crude fat, %	7.0	7.0
Serat kasar (maks)	7.0	7.0
Ash, %	14,0	14.0
Calcium, %	2.50-3.50	2.50-3.50
Phosphor total, %	0.6-1.00	0.6-1.00
Metabolizable energy, kcal/kg	2800	2800
Maximal total Alfatoksin, µg/kg	40.0	40.0
Methionine, %	0.40	0.40
Methionine+cystine, %	0.60	0.60

Note:
1) PT Sreeya Sewu Indonesia Tbk
2) Standar[16]

Fermented dragon fruit skin juice with baker's yeast. This research uses red dragon fruit skin (*Hylocereus polyrhizus*), the fermentation process of dragon fruit peel juice using fermipan brand of bread yeast. The process of processing fermented dragon fruit peel juice was done by preparing dragon fruit peel which was cut into small pieces then mixed with yeast and stored anaerobically for 5 days. After undergoing fermentation for three days, 1 kg of FDJ was blended into 1 liter of water (1:1; g/g) then filtered with double gauze. Fermented dragon fruit juice was ready to be given through drinking water according to the treatment (4-6 cc/100 cc of drinking water). The administration of FDJ in drinking water was carried out continuously during the study period.

Table 2. The content of phytochemical compounds in fermented dragon fruit peel, antioxidant activity and population of lactic acid bacteria.

Fermented dragon fruit peel	Composition
Flavonoids, mg/100 g[1]	16.6246
Tanin, mg/100 g GAEAC[1]	11.5920
Antioxsidant activity, mg/L GAEAC[1]	22.9876
Lactic acid bacteria, cfu/g	8.1×10^5

Nutrient digestibility
Nutrient digestibility was measured using the total collection method. The excreta samples were collected in sterile plastic containers for three days. The excreta and feed samples were then dried in an oven at 75^0C, then analyzed for dry matter, organic matter and crude protein content.[17] Nutrient digestibility was the difference between the nutrients consumed and the nutrients in the excretion, divided by the number of nutrients consumed multiplied by 100%. The number of lactic acid bacteria in quail intestines was analyzed using the man ragosa and sharpe agar (MRSA) method.

The research data were analyzed by means of variance and if significantly different results were obtained ($P \leq 0.05$), it was continued with Duncan's multiple distance test.

RESULTS

The results are presented in Table 3. The inclusion of 4-6% fermented dragon fruit peel juice (FDJ) in drinking water did not have a significant effect ($P \geq 0.05$) on weight gain, feed consumption, egg weight, feed efficiency, and nutrient digestibility (digestibility of DM, OM, and CP). However, the inclusion of 6% FDJ in drinking water significantly ($P \leq 0.05$) increased final body weight, carcass weight, and population of lactic acid bacteria in quail intestines.

The body weight of quail with the inclusion of 6% FDJ (P3) in drinking water during the rearing period, was 8.57% higher ($P \leq 005$) than the control (P1). Carcass weight in quail group P3 was: 16.00% significantly ($P \leq 0.05$) higher than P1. Hen Day Production (HDP) or daily egg production is the number of eggs produced by groups of poultry in a certain period.[18] The daily egg

production of quail had an average of 73.87 in treatment P1 while treatment P2 and P3 were 8.58% and 12.65% higher than P1 which were statistically significantly different (P≤0.05).

Table 3: Performance of quail aged 7-15 weeks given drinking water containing fermented dragon fruit peel juice.

Variables	FDJ Level in drinking water (cc/100 cc)			SEM[1)]
	0	4	6	
Initial body weight, g	185.62[a]	184.47[a]	188.22[a]	0.93
Final body weight, g	204.18[a]	211.97[a]	221.68[b]	2.30
Live weight gains, g/8 weeks	21.87[a]	27.50[a]	33.47[a]	2.66
Feed consumption (fc), g/day	31.48[a]	32.41[a]	32.26[a]	0.34
Egg weight, g	12.00[a]	12.29[a]	12.21[a]	0.06
Feed efficiency (fc:lwg)	2.60[a]	2.50[a]	2.44[a]	0.04
Carcass weight, g	116.88[a]	124.33[a]	135.58[b]	2.43
Hen-day production, %	73.87[a]	80.21[b]	83.21[b]	1.25
Dry matter digestibility, %	72,58[a]	76,09[a]	77,96[a]	1,38
Crude protein digestibility, %	71,75[a]	76,04[a]	77,55[a]	1,50
Organic matter digestibility, %	76,50[a]	79,88[a]	83,11[a]	1,32
Intestinal Lactic acid bacteria (CFU/g)	$1.8x10^{5a}$	$2.1x10^{5ab}$	$2.4x10^{5b}$	0.93

Note:
[1)] SEM = *Standard Error Of The Treatment Mean*
[a,b] Values with different letters in the same row show significantly different (P≤0.05).

Lactic acid bacteria (LAB) is a group of gram-positive bacteria capable of converting carbohydrates into lactic acid. Lactic acid bacteria (LAB) live in the digestive tract of quail, which functions to help absorb nutrients.[18] The average number of lactic acid bacteria in the intestines of quail group P1 was $1.8x10^5$ CFU/g, while in group P2 it was 16.57% higher than that in group P1, not statistically significant (P≥0.05), and in group P2, P3 was 33.33% higher (P≤0.05) compared to the P1 group.

DISCUSSION

The inclusion of 6% FDJ in drinking water increased final body weight, carcass weight, and population of lactic acid bacteria in quail intestines. The increase was due to the number of lactic acid bacteria contained in fermented dragon fruit peel juice as much as $8.1x10^5$ cfu/g (Table 2). Lactic acid bacteria act as probiotics, so they can help the digestive process, protect and maintain the health of the digestive system from pathogenic bacteria, so that the absorption of nutrients in the digestive tract can be maximized, and is able to maintain the host's immune system. This is in line with the opinion of[18] which states that *Saccharomyces cerevisiae* can increase the digestibility of fibrous feed and can act as a probiotic in poultry. Supplementation of *Saccharomyces cerevisiae* in the diet significantly increased growth and increased the digestibility of nutrients.[20] Piliang et al.[21] stated that the use of *Saccharomyces cerevisiae* as a source of probiotics in feed, can increase the number of lactic acid bacteria (LAB) which will affect a number of digestive processes and fat absorption in the digestive tract.

Goa et al.[22] reported that the factors affecting body weight gain were the amount of feed consumed, the physical form of the feed, the composition of the feed and the balance of the nutritional content of the feed. Numerically there was an increase in the average body weight gain of quails given by FDJ. This increase is because dragon fruit peel juice contains antioxidants as an antidote to free radicals. Escribano et al.[23] stated that the benefits of dragon fruit peel have the potential as a free radical scavenger, because it contains antioxidants. Provision of materials that contain antioxidants in livestock can reduce the effects of free radicals. Free radicals can cause oxidative stress in livestock.

From the results of statistical analysis, giving 6% FDJ through drinking water can increase quail carcass weight, because fermented dragon fruit peel juice contains yeast *Saccharomyces cerevisiae* which can increase lactic acid bacteria that act as probiotics, so that it can help the digestive process, protect and maintain a healthy digestive system, so that the final weight of the quail increased and the carcass weight also increased. Bidura et al.[24] stated that the supplementation of *Saccharomyces cerevisiae* in the diet can significantly increase growth and increase the digestibility of food substances. Utilization of *Saccharomyces cerevisiae* as a source of probiotics in feed can increase the number of lactic acid bacteria (LAB) which will affect a number of digestive processes and fat absorption in the digestive tract.[21]

The results showed that HD increased with the addition of FDJ in drinking water caused by the antioxidant content contained in the dragon fruit skin was able to reduce the effects of free radicals, so as to increase endurance and consequently the hormonal process

became better, this is in line with[25] which states that egg production is influenced by sexual maturity and hormonal processes in the body of livestock. Khuluq et al.[26] also stated that dragon fruit has anti-radical effects and high antioxidant activity. The results of the phytochemical analysis of dragon fruit peel juice (Table 2) contained 22.9876 mg/L GAEAC antioxidant activity. According to[27] which states that the antioxidant content in the ration can maintain Hen Day Production due to the presence of antioxidants can maintain the mineral content in the livestock body so that there is no mineral deficiency.

Blair et al.[28] stated that egg weight cannot be separated from the influence of egg yolk weight, the percentage of egg yolk is around 30-32% of egg weight. Achmanu and Muharlien[29] stated that egg weight is also influenced by egg laying period, and eggs in the first production of the cycle, have a lower weight than subsequent eggs in the same cycle, in other words, egg weight increases, along with increasing egg weight. parent age. Eggs produced by brood birds with faster sex maturity will produce smaller egg weights compared to eggs produced by parents who first lay eggs at a later age of sexual maturity.

The fermentation process assisted by the yeast *Saccharomyces cerevisiae* found in baker's yeast can increase lactic acid bacteria in the digestive tract of quail. Piliang et al.[21] stated that the yeast *Sacchoromyces cerevisiae* as a source of probiotics in feed could increase the number of lactic acid bacteria (LAB). Fermentation will increase the amount of LAB and improve livestock health and absorption of feed nutrients in the intestine.[30]

CONCLUSION

The inclusion of fermented dragon fruit peel juice at levels of 4% and 6% in drinking water can increase final body weight, carcass weight, daily egg production, and the number of intestinal lactic acid bacteria. The inclusion of fermented dragon fruit peel juice through drinking water did not affect nutrient digestibility, weight gain, feed consumption, feed efficiency and egg weight in quail.

ACKNOWLEDGEMENTS

The author would like to thank the coordinator of the Master's Program in Animal Science, for his permission and the staff of the Animal Food Nutrition Chemistry laboratory, Faculty of Animal Husbandry, Udayana University, for the laboratory facilities.

REFERENCE

1. Huss, D., Poynter, G., dan Lansford, R. Japanese Quail (*Coturnix japonica*) as a Laboratory Animal Model. Lab animal, 2008; 37(11): 513517.
2. Dewi G.A.M.K., I.M. Nuriyasa, dan I.W. Wijana. Optimalisasi Peningkatan Produksi Ternak Unggas dengan Pemanfaatan Limbah Kulit Buah naga (*Hylocereus sp*) Terfermentasi. Laporan Penelitian LPPM. Universitas Udayana. Denpasar, 2016; 32-39
3. Kumar K.A., Gousia S.K., Anupama M., Latha J.N.L. A review on phytochemical constituents and biological assays of Averrhoa bilimbi. International Journal of Pharmacy and Pharmaceutical Science Research, 2013; 3(4): 136-139.
4. Daniel R.S., Osfar,S. and Irfan H.D. Kajian Kandungan Zat Makanan dan Pigmen Antosianin Tiga kulit Buah Naga (*Hylocereus sp.*) sebagai Bahan Pakan Ternak. Sekripsi. Fakultas Peternakan Universitas Brawijaya. Malang, 2014.
5. Bidura, I.G.N.G. Daun Herbal dan Probiotik. Alternatif Pengganti Antibiotik Growth Promotor (AGPS) pada Ternak. Edisi I. Swasta Nulus, Jln. Batanghari, Denpasar- Bali, Indonesia, 2020.
6. Pamungkas, W. 2011. Teknologi fermentasi alternative solusi dalam upaya pemanfaatan bahan pakan lokal. Media Akuakultur, 2011; 6(1): 43-48
7. Widodo, T.S., B. Sulistyanto dan C.S. Utama. Jumlah bakteri asam laktat dalam digesta usu halus dan sekum ayam broiler yang diberi pakan ceceran pabrik pakan yang difermentasi. J. Agripet, 2015; 2(15): 98-103.
8. Bidura, I.G.N.G., I.B.G. Partama, B.R.T. Putri and N.L. Watiniasih. Effect of water extract of two leaves (*Allium sativum* and *Sauropus androgynus*) on egg production and yolk cholesterol levels in egg laying hens. Pakistan Journal of Nutrition, 2017; 16(7): 482-487. (URL: https://scialert.net/abstract/?doi=pjn.2017.482.487)
9. Bidura, I.G.N.G., N.W. Siti, A.A.P.P. Wibawa, I.N. Tirta Ariana and E. Puspani. The effect of Carot leaves meal fermented in diets on egg production, yolk cholesterol and beta-carotene in yolk of hens. Annals of the Romanian Society for Cell Biology, 2021; 25(6): 18705-18711; URL article: https://www.annalsofrscb.ro/index.php/journal/article/view/9400/6856.
10. Dewi, N.M.A.W., I. G. N. G. Bidura, N. W. Siti and I. G. M. Rusdianta. 2022. The inclusion of Papaya leaf juice in drinking water on the growth and carcass of Bali ducks (*Anas sp*.). WJPLS 8(11): 10-13; https://www.wjpls.org/home/article_abstract/2787.
11. Siti, NW., A.A.P.P. Wibawa and I.G.N.G. Bidura. Identification of phytochemical compounds in *Morinda citrifolia* and implementation of *Morinda* leaf Juice via drinking water on carcass and abdominal fat in male Bali ducks (*Anas sp*.). WJPLS, 2021; 7(10): 167-172.: file:///C:/Users/prof%20bidura/Downloads/article_1633369153%20(1).pdf.
12. Stradivari, M.P.F., Dewi, G.A.M.K., and Nuryasa I.M. The effect of fermented dragon fruit peels juice provision in dringking water on weight of 16-14 week old quail's carcass. International Journal Of Food Science and Agriculture, 2021; 5(3): 389-392.

13. Sudatri, N.W., N.M. Suartini, G.A.M.K. Dewi, IG. Mahardika, and IG.N.G Bidura. Impact of water supplementation with *Turmeric* and *Tamarind* extracts on broiler liver performance. In: First Asian PGPR Indonesian Chapter International eConference 2021, KnE Life Sciences, 2022; 458–468.; http://dx.doi.org/10.18502/kls.v7i3.11152.
14. Sukadani, NL., I.G.N.G. Bidura, I.N.T. Ariana and N.W. Siti. Effect of water extract supplementation of *Indigofera* leaves in drinking water on performance, carcass, and gut microflora in Bali ducks. World Journal of Pharmaceutical and Life Sciences, 2022; 8(4): 25-31. https://www.wjpls.org/admin/assets/article_issue/76032022/1648703365.pdf
15. Wibawa, AAPP., I.G.N.G. Bidura, I.K. Sumadi, N.W. Siti and I.M. Nuriyasa. Effect of Carrot leaf juice for growth promotion and bio-control of pathogenic bacteria in duks. World Journal of Advance Healthcare Research, 2021; 5(6): 6-12; https://www.wjahr.com/admin/assets/article_issue/30102021/1635577078.pdf
16. SNI 01-3906-2006, tentang Standar Pakan Puyuh Dara, 2006.
17. Assocciation of Official Analytical Chemists. *Official Methods of Analysis*. 15th Edition. Arlington, Virginia: Associoation of Analytical Chemists, 2005; pp. 1230
18. Ahmad, R. Z 2005. Pemanfaatan Khamir Saccharomyces cerevisiae untuk Ternak. Wartazoa, 2005; 15(1): 49-55.
19. Simanjuntak. Bakteri Asam Laktat Mampu Mengikat Toksin. Nirwana Abadi. Jakarta, 2008.
20. Bidura, I.G.N.G., D.A. Warmadewi, D.P.M.A. Candrawati, I.G.A. Istri Aryani, I.A. Putri Utami, I.B. Gaga Partama, and D.A. Astuti. The Effect of Ragi tape fermentation products in diets on nutrients digestibility and growth performance of Bali drake. Proceeding. The 1st International Seminar on Animal Industry 2009. Sustainable Animal Production for Food Security and Safety. 23-24 November 2009. Faculty of Animal Science, Bogor Agricultural University, 180-187.
21. Piliang,W.G. Manajemen Beternak Unggas. Departemen Pendidikan dan Kebudayaan. Institut Pertanian Bogor, 1992.
22. Goa, S. E. L., Silitonga, L dan Yuanita, I. Substitusi ransum jadi dengan roti afkir terhadap performa burung puyuh (Coturnix coturnix japonica) umur starter sampai awal bertelur. Jurnal Ilmu Hewani Tropika, 2015; 4(2): 61-65.
23. Escribano, J.M, A. Pedreno, F. Gracia, C. And Munoz. R. Characterization of the antiradical activity of betalains from beta vulgaris L. roots. Phytocehemical Analysis IX, 2001: 124-127.
24. Bidura, I G.N.G., Puspani, E., Warmadewi, D.A., Susila, T.G.O., dan Sudiastra, I W. Pengaruh penggunaan pollard terfermentasi dengan ragi tape dalam ransum terhadap produksi telur ayam lohmann brown. Majalah Ilmu Peternakan, 2014; 17(1): 9-15
25. Setiadi, P. Pengaruh indeks bentuk telur terhadap persentase kematian embrio, gagal tetas, dan DOD cacat pada telur itik Tegal yang di seleksi. Anim Prod., 2006; 2(1): 25-32.
26. Khuluq, A.D.S.B., Widjanarko dan Martini, E.S. Ektraksi dan stabilitas betasinanin daun darah (*Alternanthera dentate)* Kanjian perbandingan pelarut air etanol dan suhu sektrasi. Jurnal Teknologi Pertanian, 2007; VII (3): 172-181
27. Ambarwati, L. dan Saidah, N. Pengaruh penambahan selenium dan vitamin e terhadap performans ayam petelur periode afkir. Prosiding Seminar Teknologi dan Agribisnis Peternakan, 2007.
28. Blair, G.J, Ensiminger, M.E, dan W.W. Heineniman. Poultry Meat Feed and Nutrition. 2nd Ed The Ensminger Publishing Company, California, 1990.
29. Achmanu dan Muharlien. Ilmu Ternak Unggas. UB Prees. Malang, 2011.
30. Widodo, T.S., B. Sulistyanto dan C.S. Utama. Jumlah bakteri asam laktat dalam digesta usu halus dan sekum ayam broiler yang diberi pakan ceceran pabrik pakan yang difermentasi. J. Agripet., 2015; 2(15): 98-103.