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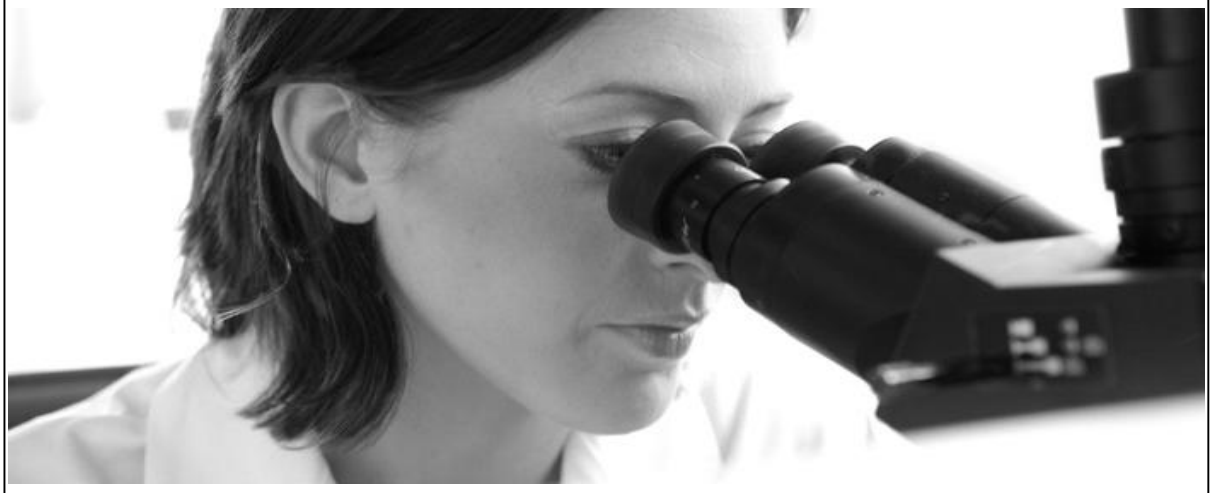

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RESEARCH ARTICLE

A SINGLE DOSE OF GINGER POWDER, SUPPORTED WITH ORGANIC ACID OR PROBIOTIC, MAXIMIZES THE LAYING, EGG QUALITY HATCHABILITY AND IMMUNE PERFORMANCES OF LAYING JAPANESE QUAILS

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ABSTRACT

Ginger roots used as a feed additive in laying hens diets, in a single or different doses, with or without another organic additives and for different durations. To assess the effect of single dose of dried ginger roots powder, individually or with citric acid and dried instant yeast on laying, reproductive performance and cellular immunity of adult Japanese quails, 72 sexed Japanese quails 6 weeks old were randomly allotted into 4 treatments with 3 replicates each (1 male with 5 females) in wire cages, (G1) supplemented with 1.5g ginger/kg diet; (G2) 1.5g ginger with 3g citric acid/kg, (G3) 1.5 ginger plus 3g dried yeast/kg diet, all in comparison with (G4) control plane, non-antibiotic treated diet, lasted for 6 weeks, from 8th-14th week of age (2weeks adaptation period). All laying hens had similar body weight, laying rate %, total egg mass, AV. Egg No. /W, AV daily and weekly feed intake and intestinal pH, with numerical non-statistical improvement in treated diets when compared to G1. Significant improvement ($P < 0.05$) were in egg weight, FCR, protein conversion ratio especially G2 and G3 in comparison to G1 and G4. Hatchability and fertility were significantly improved by G1 and G3. In conclusion, data analysis showed that, ginger plus organic acid or probiotic improved the nutritional, immune and productive parameters of laying Japanese quail.

INTRODUCTION

Recently, natural and biological feed additives used to maximize poultry meat and egg net returns; organic acids, probiotics, herbs and medicinal plants are well-known and have replaced the growth promoting antibiotics in poultry diets in many countries. Ginger root is a well-known traditional medicinal plant in many countries like China, Egypt, and India and exported worldwide; ginger has many pharmacological effects due to many phytochemicals of different biological activities. Ginger and its main compounds have shown various pharmacological effects including immunomodulation, anti-inflammatory, anti-hyperglycemic, anti-lipidemic, and antiemetic effects (Ali *et al*, 2008; KHAN *et al*, 2012). Enhance nutrient digestion and absorption because of the positive effects on the gastric secretion and digestive enzyme activities (Platel and Srinivasan, 2000). Organic acids are not antibiotics; they would be a potent tool in potentiation gastro intestinal GI-tract of poultry by managing both non-pathogenic and pathogenic enteric bacteria due to reducing intestinal pH, along with application of nutritional and bio security measures, thus improving their zoo-technical functions. (Wolfenden *et al*, 2007). Improving the protein digestibility and availability of minerals like, calcium, magnesium, phosphorus, and zinc also serve as substrates in the intermediary metabolism all these benefits of organic acids (Afsharmanesh and J. Pourreza, 2005). Yeast such as Saccharomyces cerevisiae is an examples of probiotics used for turkey, broilers, and Japanese quail (Lutful Kabir, 2009; Mountzouris *et al*, 2007). Many of the studies published, using the yeast in laying hen's diets, including Japanese quail, with small amounts per Kg of diet, improved the parameters of egg laying and reproductive performances (Nursoy *et al*, 2004; Yalcin *et al*, 2009; Yildiz *et*

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al, 2004).Unusual types of the organic and beneficial substances, with unlike doses recently can be used in different ways with growing and reproductive poultry industries, while information is lacking on the effect of ginger as a feed on laying performance. The goals of this experiment were to estimate the effects of augmenting ginger powder with citric acid and/or instant yeast on egg laying and reproductive appearance of adult Japanese quails.

MATERIAL AND METHODS

Experimental Design, Birds, and Management

A seventy two, 42 days old, sexed adult Japanese quails were purchased from Agricultural Technological Center, college of Agriculture, Cairo University, Giza, Egypt. Birds were divided into 4 equal groups, 3 replicates, and 6 birds each with a sex ratio (1) male : (5) female, in a wired layer cages of 45 L×50 W×35 H cm. Cages were randomly placed in a ventilated room with temperature between 23 to 29°C. A laying and reproductive trial was begun after two-week adaptation period and persist for six weeks. All feeding conditions were the same between adaptation and measurement periods.

Diets and additives

All dry mash yellow corn and soybean based layers diet, following the ideal nutritional requirements described by the (NRC, 1994) and containing 20% CP and 2900 Kcal ME/kg diet, (Table 1), fed to the control group (G1). The group G2 was fed the basal diet plus 1.5g ginger powder/ kg diet; G3= basal diet plus 3g dried yeast and 1.5 ginger powder/kg diet; G4= basal diet plus citric acid salt and 1.5 ginger powder/kg diet. Diets were offered twice daily for ad libitum intake and laying hens had free access to water throughout the entire experimental period. Feed residues were collected and weighed weekly to enable estimation of average daily intake (ADI) and average weekly feed intake (AWFI). All birds' body weight (g) was recorded at the beginning of the experiment. According to (Yalcın *et al,* 2008), an artificial lighting program 17 hr. light (L): 7 hr. dark (D) was applied throughout the experimental period. Mortalities and health status were visually observed and recorded daily throughout the entire experimental period.

Laying performance

Egg collection was done daily (from 8th week of age). For each replicate, egg No., egg weight and laying rate (using electric balance with sensitivity of 0.0001) were recorded daily. Egg mass was calculated by multiplying egg No. by average egg weight of the whole period (Olawumi and Ogunlade, 2008). Feed conversion (g feed/ g egg) was calculated after subtracting the male consumption from the total amount of the feed consumed.

Reproductive performances

At the first week of the experimental period, the eggs were collected twice daily from each group, stored at 18oC for 6 days (Petek *et al,* 2005). Eggs incubated in standard automatic incubator for 17 days (14 day incubation at 37.5oC with 65% relative humidity (RH) and 3 days at hatcher with 75% RH), to follow the effect of used feed additives on fertility, hatchability rates.

Table 1 the composition and calculated chemical analysis of the experimental basal diet.

Ingredients	Basal diet
Ground yellow corn	62.6
Soya bean meal (44%)*	16.3
Corn gluten (62%)*	11.1
Wheat bran	2
Dicalcium Phosphate	1.33
Limestone	5.75
DL – Methionine	0.1
Lysine	0.2
Iodized sodium chloride	0.3
Mineral& Vitamins premix**	0.3
Calculated composition	
Crude protein (%)	20.0
ME (kcal per kg)	2900.0
Calorie/protein ratio(C/P)	145.0
Calcium (%)	2.5
Available phosphorus (%)	0.35

*Determined value.

**High mix premix, each 3 kg provide: Vit. A 15 mIU, vit. D3 2 mIU, vit. E 1000mg, vit. k3 1000mg, vit. B1 1000mg, vit. B2 5000mg, vit. B6 1500mg, vit. B12 10mg, biotin 50mg, pantothenic acid 10000mg, nicotinic acid 30000mg, folic acid 1000mg, manganese 60000mg, zinc 50000mg, iron 30000mg, copper 4000mg, iodine 300mg, selenium 100mg, cobalt 100mg, carrier(CaCO3) to 3kg.

Cellular immunity assay

Three weeks after beginning cellular immunity was assessed by a cutaneous basophil hypersensitivity (CBH) test in vivo by using phytohaemagglutenin intradermal injection in right wing web with100 μg of PHA in 0.10 mL of physiological saline solution. The left wing web was similarly injected with 0.10 mL of physiological saline solution to serve as controls. The CBH response was calculated as CBH= PHA response, right foot – saline response, left foot; wherever PHA response= (post-injection skin thickness, right foot) – (pre-injection skin thickness, right foot). Saline response= (post-injection skin thickness, left foot) – (pre-injection skin thickness, left foot) (Kidd *et al,* 2001).

Bone parameters

After termination of feeding trial, two birds from each replicate were dissected to scope intestinal content pH with a digital pH meter, then the left metatarsal bones were detached and dried up at 60^{o}c for 72 h. the weight, length and girth of the dried bones were measured. The fat-free dry bones were ashed at 550^{o}c for overnight to determine crude ash%.

Statistical analysis

One-way analyses of variance of all measured parameters were conducted. Any significant differences were further analyzed using Duncan's multiple range test by SPSS 16.

RESULTS AND DISCUSSION

By the end of laying performance trial from 8th -14th week of age results of body weight, egg laying, reproductive and cellular immune responses values are tabulated. In spite of the fact that ginger root has been used as a flavoring and herbal medication for many years, no fact finding exists on the benefit of it as a feed additive for Japanese quail laying hens. In this study, all laying hens had non statistical differences in body weight; appeared healthy and no mortality occurred throughout the entire experimental period. Almost all treated groups compared with the control have the same ADI and AWFI; there were numerical non statistical increase in egg laying rate and AEM with highest No. for citric acid supported ginger group (G3).

Table 2 Average daily and weekly intake, egg mass and laying rate%.

Groups	Av D. I.	Av W.I	Av EM	Laying rate
Ginger	38.7±0.3	270.6±2.1	2.23± 0.1	86.0±4.5
G + Y	38.7±0.5	270.8±3.6	2.36±0.03	83.8±3.4
G+ C	38.9±0.1	272.6±0.6	2.56±0.2	89.8±6.3
Control	39.6±0.2	276.9±1.1	2.10±0.2	82.2± 6.5

Values are means± SE
Data within the same column (P<0.05)

Data obtained in this study demonstrated that (Table 2), Japanese quail laying hens consumed ginger powder mixed with citric acid or probiotic showed increased AEM and laying rate% (Incharoen *et al*, 2010; Zhao *et al*, 2011). A significant response due to dietary feed additives was reflected on FCR values and PCR (p<0.05) in G2 and G3 Fig (1); agreed with (Park *et al*, 2010) who observed that, 0.2% organic acid resulted in improvement of FCR in laying hens; moreover, the enhanced protein utilization also reflected on values of AEW which significantly increased in G2 and G3 with highest value for G3. One of the mechanism of this effect is connected with the reduction of intestinal pH Fig. 2, which leads to an increase in the activity of digestive enzymes (accelerated conversion of pepsinogen to pepsin) and in the solubility of minerals. Major influence on the laying hens' health and production is given by the relationship existing between intestinal bacterial population, gut morphology, immune system and nutrients absorption (Radu-Rusu and I. M. Pop, 2009).

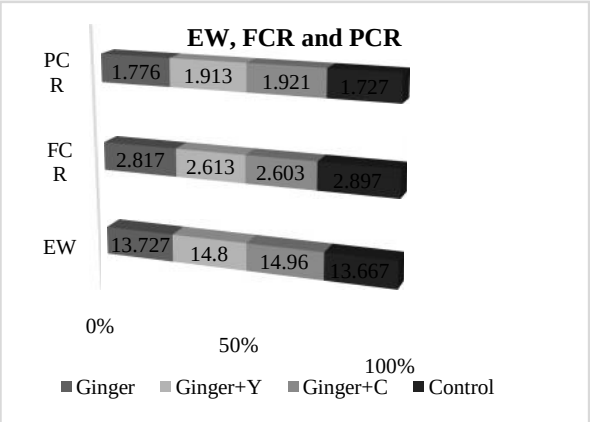

Fig. 1 egg weight, FCR and PCR

Metatarsal bone ash%, length and girth table 2 showed that, numerical decrease in bony ash profile in all treated groups in comparison with the control, that is in harmony with high higher egg laying rate and egg weight and improved the hypothesis that G+Y and G+C mix content improved Ca availability during high production. Organic acids (citric acid) improved calcium Ca availability by chelating Ca and reducing the formation of insoluble Ca-phytate-complexes (Boling *et al*, 2000). Diet supplemented with organic acids had significantly higher Ca and phosphorous P blood concentrations (Abdel-Fattah *et al*, 2008). Data in harmony with high production obtained with ginger powder and organic acid or probiotic yeast.

Table 3 Average metatarsal bone ash% content, length and girth

Groups	Ash%	Length	Girth
Ginger	30.6±1.2	3.52±0.1	0.46±0.02
G+Y	32.7±0.9	3.72±0.06	0.5±0.01
G+C	31.9±0.5	3.57±0.07	0.51±0.02
Control	32.2±1.7	3.44±0.05	0.49±0.01

Values are means± SE
Data within the same column (P<0.05)

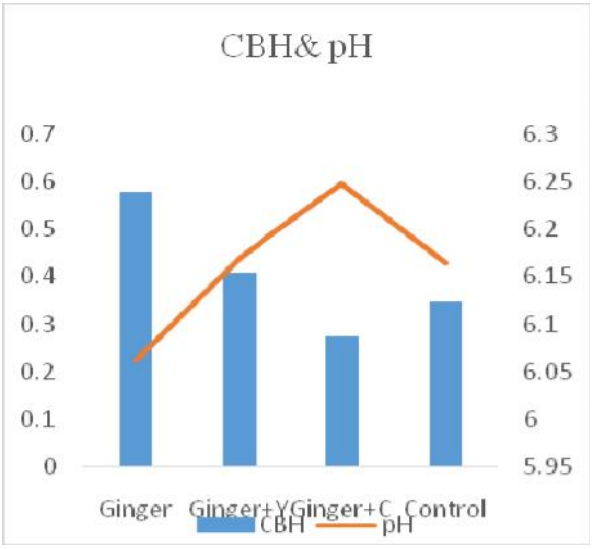

Fig. 2 cellular immunity and intestinal pH

The more simple and applicable intradermal injection of PHA, is a widely used as an in vivo cell mediated immune response test **Fig. 2 G1** accelerated the immune response with highest value in comparison with other groups, while the lowest value was for G3 of highest production level in terms of EW, EM and laying rate; that may be due to high production concerned as stress factor resulted in decrease in cellular immune profile. the immune enhancing effect of ginger powder as an immune-modulating agent may be due to the improved antioxidant status in the serum of laying hens that likely attributed to the antioxidant compounds such as gingerols, shogaols, gingerdiol, gingerdione, and some relating phenolic ketone derivatives (Afshari *et al*, 2007; Kota *et al*, 2008; Stoilova *et al*, 2007).

The Fig. (3) Showed that the effect of treatments on hatchability and fertility % in which G1 and G3 resulted the difference while G2 and G4 almost the same, that supporting the positive effect of ginger and ginger with organic acid on fertility and hatchability.

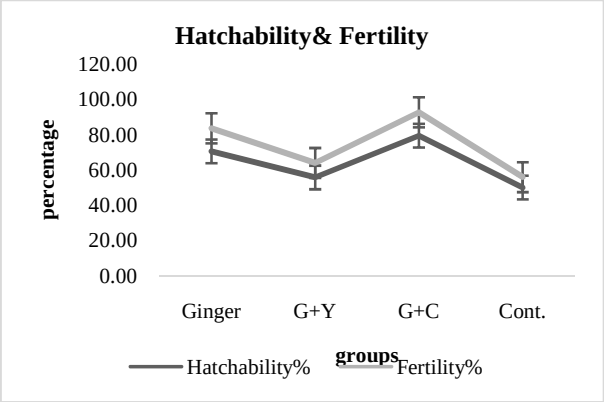

Fig. 3 Hatchability and Fertility performance

CONCLUSION

The intense pressure on the poultry industry and the scientific community to find alternatives to antibiotic growth promoters for food producing animals is the driving force behind this work. In conclusion, data analysis showed that, ginger as a medicinal plant, supported with organic acid or probiotic in laying Japanese quail diets improved the laying performances, egg quality, FCR, bone parameters and the above measured reproductive parameters.

References

Abdel-Fattah, S.A., EI-Sanhoury, M. H., EI-Mednay, N. M. and Abdul-Azeem, F. 2008. Thyroid activity of broiler chicks fed supplemental organic acids. *International Journal of Poultry Science* 7: 215-222.

Afshari, A.T., Shirpoor, A., Farshid, A., Saadatian, R., Rasmi, Y., Saboory, E., Ilkhanizadeh, B., and Allameh, A. 2007. The effect of ginger on diabetic nephropathy, plasma antioxidant capacity and lipid peroxidation in rats. Food Chemistry 101: 148-153.

Afsharmanesh, M., and Pourreza, J. 2005. Effects of calcium, citric acid, ascorbic acid, vitamin D on the efficacy of microbial phytase in broiler starters fed wheat-based diets: Performance, bone mineralization and ileal digestibility. *International Journal of Poultry Science* 4: 418-424.

Ali, B.H., Blunden, G., Tanira, M.O., and Nemmar, A. 2008. Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): a review of recent research. Food and chemical toxicology : an international journal published for the British *Industrial Biological Research Association* 46: 409-420.

Boling, S.D., Douglas, M.W., Snow, J.L., Parsons, C.M., and Baker, D.H. 2000. Citric acid does not improve phosphorus utilization in laying hens fed a corn-soybean meal diet. Poultry science 79: 1335-1337.

Incharoen, T., Yamauchi, K., and Thongwittaya, N. 2010. Intestinal villus histological alterations in broilers fed dietary dried fermented ginger. *Journal of animal physiology and animal nutrition* 94: 130-137.

Khan, R.U., Naz, S., Nikousefat, Z., Tufarelli, V., Javdani, M., Qureshi, M.S. And laudadiO, V. 2012. Potential applications of ginger (Zingiber officinale) in poultry diets. *World's Poultry Science Journal* 68: 245-252.

Kidd, M.T., Peebles, E.D., Whitmarsh, S.K., Yeatman, J.B., and Wideman, R.F., Jr. 2001. Growth and immunity of broiler chicks as affected by dietary arginine. Poultry science 80: 1535-1542.

Kota, N., Krishna, P., and Polasa, K. 2008. Alterations in antioxidant status of rats following intake of ginger through diet. Food Chemistry 106: 991-996.

Lutful Kabir, S.M. 2009. The role of probiotics in the poultry industry. *International Journal of Molecular Sciences* 10: 3531-3546.

Mountzouris, K.C., Tsirtsikos, P., Kalamara, E., Nitsch, S., Schatzmayr, G., and Fegeros, K. 2007. Evaluation of the efficacy of a probiotic containing Lactobacillus, Bifidobacterium, Enterococcus, and Pediococcus strains in promoting broiler performance and modulating cecal microflora composition and metabolic activities. Poultry Science 86: 309-317.

NRC. Nutrient Requirements of Poultry, 9th Edn, National Academy Press

Washington, D.C. (1994).

Nursoy, H., Kaplan, O., Oguz, M.N., and Yilmaz, O. 2004. Effect of varying levels of live yeast culture on yields and some parameters in laying hen diets. *Indian Veterinary Journal* 81: 59-62.

Olawumi, S.O., and Ogunlade, J.T. 2008. Phenotypic correlations between some external and internal egg quality traits in the exotic isa brown layer breeders. *Asian Journal of Poultry Science* 2: 30-35.

Park, S.W., Branton, S.L., Gerard, P.D., Womack, S.K., and Peebles, E.D. 2010. Influence of supplemental dietary poultry fat, phytase, and 25-hydroxycholecalciferol on the performance of commercial layers inoculated before or at the onset of lay with F-strain Mycoplasma gallisepticum. Poultry Science 89: 910-916.

Petek, M., H. Baspinar, M. Ogan, and F. Balci 2005. Effects of egg weight and length of storage period on hatchability and subsequent laying performance of quail. Turk J Vet Anim Sci 2: 537-542.

Platel, K., and Srinivasan, K. 2000. Influence of dietary spices and their active principles on pancreatic digestive enzymes in albino rats. Die Nahrung 44: 42-46.

Radu-Rusu, C.G., and I. M. Pop 2009. Improvement of laying hen performances by dietary mannaoligosaccharides supplementation. Universitatea de Ştiinţe Agricole şi Medicină Veterinară Iaşi Lucrări Ştiinţifice, Seria Zootehnie 52: 215-219.

Stoilova, I., Krastanov, A., Stoyanova, A., Denev, P., and Gargova, S. 2007. Antioxidant activity of a ginger extract (Zingiber officinale). Food Chemistry 102: 764-770.

Wolfenden, A.D., Vicente, J .L., Higgins, J. P., Andreatti Filho, R.L., Higgins, S. E., Hargis, B. M. and Tellez, G. 2007. Effect of Organic Acids and Probiotics on Salmonella enteritidis Infection in Broiler Chickens. *International Journal of Poultry Science* 6: 403-405.

Yalcın, S., O¨zsoy, B., Erol, H., and Yalcın, S. 2008. Yeast culture supplementation to laying hen diets containing soybean meal or sunflower seed meal and its effect on performance, egg quality traits, and blood chemistry. *Journal of Applied Poultry Research* 17: 229-236.

Yalcin, S., Oguz, F., Guclu, B., and Yalcin, S. 2009. Effects of dietary dried baker's yeast on the performance, egg traits and blood parameters in laying quails. Tropical animal health and production 41: 5-10.

Yildiz, A.Ö., Parlat, S.S., and Yildirim, I. 2004. Effect of dietary addition of live yeast (Saccharomyces cerevisiae) on some performance parameters of adult Japanese quail (Coturnix coturnix japonica) induced by aflatoxicosis. Rev Méd Vét 155: 38-41.

Zhao, X., Yang, Z.B., Yang, W.R., Wang, Y., Jiang, S.Z., and Zhang, G.G. 2011. Effects of ginger root (Zingiber officinale) on laying performance and antioxidant status of laying hens and on dietary oxidation stability. Poultry Science 90: 1720-1727.

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