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Dietary Supplementation of Phytobiotics on Production Performance of Nandanam Chicken-3

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ABSTRACT: The improved meat purpose chicken varieties with fast growing abilities have been developed for rural poultry farming in India. The need for discontinuing antibiotic growth promoters has led to the search for herbal alternatives in poultry production. The dietary supplementation of phytobiotics on production performance of Nandanambroiler 3, is a synthetic cross for meat purpose was studied. One hundred and twenty, straight run one day old Nandanam chicks 3 (n=120) were allotted into four treatment of 30 chicks in three equal replicates. A common control diet was formulated for starting and finishing periods. The four dietary treatments were control (T1), control with 0.5% ginger paste (T2), control with 0.5% garlic paste (T3) and control with 0.5% turmeric powder (T4). The data on body weight, feed consumption and mortality were recorded biweekly; from which, weight gain and feed efficiency were calculated. The mean body weight at eighth week was significantly (P<0.01) higher in garlic supplementation (T3: 1068.20g) and ginger supplementation (T2: 1064.10g) compared to turmeric supplementation (T4: 861.87g) and control (T1: 874.72g). The mean final weight gain was also significantly (P<0.01) higher in T3 (1031.53g), T2 (1029.01g) compared toT1 (837.72g) and T4 (824.72g). In respect of overall FCR, the best value of 2.24 was recorded in T2 followed by 2.26 in T3, 2.91 in T1 and T4. The present study showed that at the end of the experiment, significantly (P<0.05) higher livability of 99.08% was observed in T2, followed by 98.22% in T4, 95.93% in T1 and 95.35% in T3. The results revealed that there was increased weight, weight gain and improved FCR at ginger and garlic group. The Return over Feed Cost in terms of Rs/bird were also better in ginger and garlic supplementation. The mean per centlivability was higher in T2 followed by T4, T1 and T3. It was concluded that better production performance in terms of growth rate, feed efficiency and Return over Feed Cost can be achieved with supplementation of garlic or ginger paste at the rate of 500g/ 100 kg feed in improved meat type chicken varieties.

Keyword: Body weight, Feed intake, Livability, Phytobiotic, Return over feed cost.

INTRODUCTION

The poultry farming responsible for about 80% of the total expenses only feed cost (Asghar *et al.*, 2000). The improvement of broiler production has grown rapidly which is mostly enhanced to the feed utilization and growth rate. Constantly, the use of natural promoters like phytogenic compounds to enhance the performance of broiler chickens have been reported with varying levels of benefits (Borazjanizadeh *et al*., 2011). The herbal feed additives mostly spices as an additive in the diet of chicken is very common. The natural growth promoteslike garlic and ginger can be potentially alternatives for common artificial growth promoters (Demir *et al.*, 2003). Garlic (*Allium sativum*) has been indicated to possess antibacterial, antifungal, anti-parasitic, antiviral, antioxidant, anti-cholesteremic, anti-cancerous and vasodilator characteristics (Hanieh *et al.*, 2010). Ginger and garlic supplements in broiler chicken diets have been reported for their strong stimulating effect on the immune and digestive systems in birds (Gardzielewska *et al*., 2003). Turmeric the active ingredient is curcumin, which has potent antioxidant and anti-inflammatory, hepatoprotective, anti-carcinogenic and antimicrobial properties (Pal *et al*., 2001).With this background, an experiment was

conducted using Nandanam broiler 3, a synthetic colour broiler chicken, to evaluate the efficacy of ginger and garlic pastes and turmeric powder, individually as feed additives, all at a common level of 500g/100 kg in the diet.

MATERIALS AND METHODS

The study was conducted at Madhavaram, Chennai in Poultry Research Station, TANUVAS. Totally 120 day-old Nandanam chicken 3 chicks were randomly allotted into four treatment groups with three replicates of ten chicks in a Completely Randomized Design. The standard broiler diet was prepared as per BIS (2007) for all the treatments. The experimental design and nutrient composition of the diet are presented in Tables 1 and 2 respectively. The control diet (T1) was formulated without any antibiotics or growth promoters. The experimental diets were formulated by the control diet with 0.50 per cent ginger paste (T2) or 0.50 per cent garlic paste (T3) or 0.50 per cent turmeric powder (T4). The chicks were reared first 3 weeks of age in a broiler brooder cage and remaining 5 weeks in deep litter system with allotted space of the houses. The whole experimental period was maintained under standard management conditions.

Table 1: Design of Experiment.

Treatment	Replicates	Total
T1-Control	3	30
T2-Control + Ginger paste 0.50%	3	30
T3-Control + Garlic paste 0.50%	3	30
T4-Control + Turmeric powder 0.50%	3	30

Table 2: Nutrient composition of the experimental broiler diet.

Name of the ingredient	Inclusion level (%)	
	Broiler starter (0-21 days)	Broiler finisher (22-56 days)
Maize	50.90	55.75
Deoiled rice bran	-	2.98
Soya bean meal	38.20	31.50
Oil	6.00	6.50
Salt	0.50	0.10
Mineral mixture	2.00	2.00
Calcite powder	0.80	0.25
Dicalcium phosphate	0.50	0.50
Vitamin mixture (AB_2D_3K)	0.02	0.01
Feed additives**	1.08	0.41
Total	**100**	**100**
Nutrient composition of the experiment ration		
Crude protein (%)	21.98	19.84
ME (Kcal/kg)	3097	3204
Lysine (%)	1.33	1.21
Methionine (%)	0.44	0.42
Calcium (%)	1.17	0.96
Available Phosphourus (%)	0.44	0.35
**Feed additive mixture contained lysine, methionine, ultravit M, perivac plus, choline chloride and cosmodox EP		

The data on body weight, feed intake and mortality were recorded. Birds were individually weighed bi-weekly upto 56 days of age by using electronic weighing balance. The body weight gain was arrived from the data on body weight. Weighed quantity of feed was fed daily to the birds from this feed consumption and feed efficiency was calculated. Mortality was recorded on its occurrence from this per cent livability was worked out. Return Over Feed Cost (ROFC) was calculated by subtracting the total feed cost from the income for growing one bird (Rs. per bird) during the period of 56 days.

Statistical analysis: The data was collected, and subjected to statistical analysis by ANOVA using Completely Randomized Design as described by Snedecor and Cochran (2002). The treatment means were compared by critical differences (CD).

RESULT AND DISCUSSION

Body weight and body weight gain: The values on body weight and weight gain obtained in this study are presented in Table 3 and 4. There was significantly ($P<0.01$) higher body weight at second week of age in ginger supplemented group (T2: 164.24g) compared to garlic (T3: 127.00g) and turmeric (T4: 104.23g) groups and to control (102.81g). Similarly, there was significantly ($P<0.01$) higher body weight gain at second week of age in ginger supplemented birds (T2: 129.15g) compared to garlic (T3: 90.33g) and turmeric (T4: 67.08g) supplemented birds and control (T1:

65.81g). Similar observations were made by Belal *et al*., (2018); Shewita and Taha (2018) of significant (P<0.05) improvement in the body weight and weight gain in broiler chicken due to inclusion of ginger in the diet. In contrary, Barazesh *et al*., (2013); Herawati (2010) reported non-significant effect on body weight and weight gain due supplementation of ginger when included in the broiler diet. Suriya *et al*., (2012) stated that during the starter phase (0-3 weeks), 0.25 and 0.50% turmeric fed chickens performed better in terms of weight gain. In contrast, El-Hakim *et al*., (2009); Namagirilakshmi (2010) observed insignificant weight gain in broilers when their diets were supplemented with of turmeric powder.

The body weight and weight gain at fourth week of age was significantly (P<0.01) high in T3 (garlic 0.50%) and T2 (ginger 0.50%) compared to T4 (turmeric 0.50%) and control groups. The body weight at sixth week of age was significantly (P<0.05) high in garlic fed birds (774.26g), followed by ginger fed birds (698.35g); whereas, lowest body weights were recorded in turmeric fed birds (644.57g) and control (632.93g) respectively. There was no significant (P>0.05) difference in body weight gain at sixth week of age. The body weight and weight gain at eighth week of age was significantly (P<0.01) high in garlic (T3) and ginger (T2) supplemented birds compared to turmeric (T4) supplemented birds and control (T1). The average final weight gain were significantly (P<0.01) high in garlic (1031.53g) ginger and (1029.01g) supplemented birds compared to turmeric supplemented birds (824.72g) and control (837.72g). Similarly, Meraj, (1998) was observed by the improvement in body weight gain of the broiler birds using garlic in their rations may probably be due to the presence of allicin. This study clarified that the birds fed ration supplemented with ginger and garlic utilized their feed more efficiently than those of turmeric added ration. Similar observations were made by Shewita and Taha (2018), who reported that final body weight and total body weight gain improved after supplementation of ginger at levels of 2 and 4g per kg diet. Borgohain *et al.*, (2017); Patel *et al.*, (2017); Belal *et al.*, (2018) who have reported that supplementation of garlic powder improved the final body weight of broiler chicken. The body weight was significant (P<0.01) increase in garlic at the rate of 0.1% as compared to garlic at the rate of 0.5% and control (Makwana *et al.*, 2015). Patel *et al*., (2017) also reported significantly (P<0.05) higher average daily weight gain in 0.5% garlic supplemented group. In contrast, Jakubcova *et al.*, (2014) also reported that body weight gain of broiler chicken was not affected by the supplementation of garlic powder in feed. Karangiya *et al*., (2016) fed broiler chicken with 1% garlic and 1% ginger and reported higher (P<0.05) weight gain (g) in broilers compared to control. Similar findings were made by Safa and Eltazi (2014) reported significantly (P<0.05) heavier final body weight and weight gain in broiler chickens by combination effect of 1.5%garlic + 0.25% ginger in the diet. Barad *et al.*, (2017) included 2% turmeric powder in broiler diet and stated that body weight gain was significantly (P<0.05) higher when compared to control, contrary to the present results. Similarly improved body weight gain was also observed in broilers by inclusion of turmeric powder at about 0.75 to 1.0% in diet (Al-Kassie *et al*., 2011).

Table 3: Supplementation of phytobiotics on body weight (g) of Nandanam chicken-3.

Age in weeks	T1	T2	T3	T4	F- Value
0	37.0 ± 0.66	35.09 ± 0.46	36.67 ± 0.60	37.15 ± 0.77	2.218^{NS}
2	102.81 ± 8.68^{b}	164.24 ± 2.72^{a}	127.00 ± 6.79^{b}	104.23 ± 6.15^{b}	28.003^{**}
4	307.32 ± 6.11^{b}	360.20 ± 22.84^{a}	383.90 ± 17.29^{a}	325.73 ± 12.29^{b}	5.921^{**}
6	632.93 ± 21.56^{c}	698.35 ± 39.67^{b}	774.26 ± 46.15^{a}	644.57 ± 24.38^{c}	3.929^{*}
8	874.72 ± 24.30^{b}	1064.10 ± 44.29^{a}	1068.20 ± 44.46^{a}	861.87 ± 28.09^{b}	11.044^{**}

**Significant (P<0.01); *Significant (P<0.05); ^{NS}Not Significant (P>0.05); Mean values sharing any one common superscript in a row or column do not differ significantly (P>0.05)

Table 4: Supplementation of phytobiotics on body weight gain (g) of Nandanam chicken-3.

Periods Week)	T1	T2	T3	T4	F- Value
0 - 2	65.81 ± 8.57^{c}	129.15 ± 2.93^{a}	90.33 ± 6.66^{b}	67.08 ± 6.09^{c}	29.909^{**}
3 - 4	204.51 ± 6.38^{c}	195.96 ± 16.67^{c}	256.90 ± 11.99^{a}	221.50 ± 9.51^{b}	27.121^{**}
5 - 6	325.61 ± 21.67	338.15 ± 26.77	390.36 ± 36.83	318.85 ± 14.96	1.415^{NS}
7 - 8	241.79 ± 19.63^{b}	365.75 ± 36.99^{a}	369.85 ± 19.70^{a}	217.30 ± 20.64^{b}	7.990^{**}
Overall cumulative	837.72 ± 24.26^{b}	1029.01 ± 45.64^{a}	1031.45 ± 44.50^{a}	824.72 ± 28.94^{b}	10.631^{**}

**Significant (P<0.01); ^{NS} Not Significant (P>0.05); Mean values sharing any one common superscript in a row or column do not differ significantly (P>0.05)

Feed consumption and Feed conversion ratio: Mean (± SE) feed intake and feed conversion ratio are presented in Table 5. Mean total feed intake was low birds receiving 0.5% ginger (T2) followed by the birds receiving 0.5% garlic (T3), 0.5% turmeric (T4) and control (T1). The results of present study agreed with the findings of Shewita and Taha (2018) also reported that broiler that received higher level of ginger (6g/kg) in the diet had decreased total feed intake. Herawati (2011) also found that increasing ginger to a ratio up to 2% (20g/kg diet) reduced the feed intake. Suriya *et al.*, (2012) included various levels of phytobiotics in broiler diets from 1 to 42 days of age and reported that garlic at the rate of 0.5% in the diet lower feed intake than 0.5% turmeric powder. In contrast to the present findings, Karangiya *et al.,* (2016) fed broiler chicken with 1 % ginger, 1% garlic or 1% ginger + garlic. They observed that 1% ginger and 1% ginger +garlic had induced significant (P<0.05) increase in feed intake. Belal *et al.*, (2018) also reported that total feed intake significantly (P<0.05) higher with 0.15% ginger, 0.15% garlic and 0.075% ginger plus 0.075% garlic at broiler fed 35 days of age. Significantly lower feed intake was observed by Durrani *et al*., (2006) with turmeric supplementation in broiler diet similar to the findings of present study. In contrast, Al-Kassie *et al*., (2011) reported by increased feed consumption in broilers was observed with the supplementation of diet with powdered rhizome of *Curcuma longa* at about 0.75 to 1g /kg in the diet. Similarly, Suriya *et al*., (2012) also reported that 0.25% turmeric had higher feed intake. Abdollah *et al*. (2012) reported no influence in feed intake due to turmeric powder supplementation.

The overall Feed conversion Ratio (FCR) was best in ginger supplementation (2.24) followed by garlic supplementation (2.26), control (2.91) and turmeric supplementation (2.91). There was a significant (P<0.01) improvement in the FCR of the birds fed on diets supplemented with garlic paste (T2), (T3) compared to other treatments. Makwana *et al.,* (2015) demonstrated that the FCR was significantly (P<0.05) better in birds receiving 0.1% garlic. The feed conversion ratio was significantly (P<0.05) higher in the 0.5% garlic and 0.5% fenugreek supplemented groups compared to control (Patel *et al.,* 2017). The present study agrees with the findings of several earlier workers (Borgohain *et al.,* 2017 and Karangiya *et al.,* 2016) who also found significantly improved FCR due to supplementation of garlic powder at various levels. In contrary to the present findings, Amouzmehr *et al.,* (2013) and Oleforuh-Okole *et al.,* (2014) found no significant differences in FCR due to supplementation of garlic powder in broiler chickens. Similar to the present findings, Belal *et al.,* (2018) reported that the supplementation of ginger and garlic only in the diet of the birds significantly (P<0.05) improved the FCR compared to control. In contrast, Thayalini *et al*. (2011) and Ademola *et al.,* (2009) stated that they could not detect any significant improvement in the FCR of broilers fed diet supplemented with ginger powder as compared to the control.

Table 5: Supplementation of phytobiotics on feed intake and FCR of Nandanam chicken-3.

Parameters	T1	T2	T3	T4	F- Value
Feed intake	2.550 ± 1.01	2.380 ± 8.39	2.420 ± 2.09	2.510 ± 2.78	
FCR	2.91 ± 0.07^{a}	2.24 ± 0.11^{b}	2.26 ± 0.11^{b}	2.91 ± 0.09^{a}	8.738^{**}

** Significant (P<0.01); Mean values sharing any one common superscript in a row or column do not differ significantly (P>0.05)

Livability (%): The supplementation of phytobiotics on livability were presented in (Table 6). The overall livability were significantly (P<0.01) higher in ginger (T2) and turmeric (T4) group compared to control (T1); whereas the birds fed garlic in the fed (T3) did not showed any improvement than control. Similarly, Belal *et al*., (2018) also reported cent percent livability in a broilers fed diet containing 0.5% ginger in powder form. In contrast to the present findings, Barazesh *et al*., (2013) reported that mortality was not significant in the broilers fed with diets containing 0.5, 1.0, and 1.5% ginger. Similar to the findings of this study, Safa and Eltazi (2014) also reported that not significantly affected mortality by various level of garlic (0.75, 1.0 and 1.5 percent) in broiler experiments. In contrast, Borgohain *et al.,* (2017) reported cent per cent livability in all experimental groups fed 0.5, 1.0 and 1.5 per cent garlic powder.

Table 6: Supplementation of phytobiotics on livability of Nandanam chicken-3.

Periods (Week)	T1	T2	T3	T4	F- Value
0 - 2	84.06 ± 2.24^{c}	100.00 ± 0.00^{a}	81.76 ± 1.98^{c}	93.41 ± 1.22^{b}	6.105^{**}
3 - 4	99.66 ± 0.34^{a}	98.68 ± 0.42^{b}	100.00 ± 0.00^{a}	100.00 ± 0.00^{a}	1.025^{**}
5 - 6	100.00 ± 0.00^{a}	98.85 ± 0.43^{b}	99.64 ± 0.35^{a}	100.00 ± 0.00^{a}	0.792^{*}
7 - 8	100.00 ± 0.00a	98.81 ± 0.44b	100.00 ± 0.00a	99.45 ± 0.37a	0.793^{*}
Overall	95.93 ± 1.08^{b}	99.08 ± 0.19^{a}	95.35 ± 1.17^{b}	98.22 ± 0.49^{a}	3.070^{**}

**Highly Significant (P<0.01); *Significant (P<0.05); ^{NS}Not Significant (P>0.05); Mean values sharing any one common superscript in a row or column do not differ significantly (P>0.05)

Economics: The income was significantly (P<0.01) higher in ginger and garlic supplemented groups compared to control; whereas, turmeric supplementation has not significantly (P>0.05) improved the returns were presented in (Table 7). The overall feed cost per bird during this experimental period was significantly (P<0.01) higher in turmeric supplementation (T4) and control (T1) compared to supplementation of other two herbal products (T2 and T3). ROFC was significantly (P<0.01) lower in turmeric supplementation groups. ROFC in terms of Rs/bird was highest in ginger (T2: Rs. 86.75) and garlic (T3: Rs. 86.11) supplementation compared to control (T1: Rs. 42.63) and turmeric supplementation (T4: Rs. 34.38). Similarly, Moorthy *et al*., (2009) reported that mean return over feed cost of broiler fed with 0.2% ginger powder and 0.2% ginger + 0.2% pepper was significantly (P<0.01) higher. Karangiya *et al*., (2016) also reported that income from selling of the birds was significantly (P<0.05) higher in 1% ginger supplemented group than the control. Oleforuh-Okoleh *et al*., (2014) reported the birds fed with garlic in powder form at 14g/kg of the diet gave the highest revenue and net return followed by birds fed with ground ginger at 14g/kg than control. Borgohain *et al*., (2017) reported that higher gross profit per broiler in 0.5% garlic to other groups. Makwana *et al*., (2015) reported that total feed cost, total cost/kg live was reduced (P<0.05) in 0.1% garlic as compared to 0.5% garlic supplemented birds or control. In contrast to the present findings, Mohammed and Yusuf (2011) found no differences in cost of feed per kg gain in broilers with dietary supplementation of ginger.

Table 7: Supplementation of phytobiotics on economic parameters of Nandanam chicken-3.

Parameters	T1	T2	T3	T4	F- Value
Feed cost /kg (Rs.)	34.00	34.50	34.65	34.30	
Feed cost (Rs./ bird)	96.38 ± 2.42^{a}	84.16 ± 3.89^{b}	82.46 ± 3.74^{b}	102.85 ± 3.24^{a}	8.75^{**}
Income from bird sold (Rs./bird)	139.01 ± 3.89^{b}	170.91 ± 7.77^{a}	168.57 ± 7.32^{a}	137.23 ± 4.07^{b}	10.67^{**}
Return over feed cost (Rs./bird)	42.63 ± 6.23^{b}	86.75 ± 10.94^{a}	86.11 ± 11.02^{a}	34.38 ± 7.85^{b}	9.88^{**}

**Significant (P<0.01); Mean values sharing any one common superscript in a row or column do not differ significantly (P>0.05)

CONCLUSION

It can be concluded from this study that body weight, body weight gain and FCR can be improved in synthetic colour broiler strains by the supplementation of garlic and ginger at the rate of 0.5% in the feed. Better Return over Feed Cost (Rs/bird) and Return over feed cost (Rs./kg live weight) can also be achieved with the supplementation of above two herbal products; whereas, inclusion of ginger and turmeric can improvelivability. Therefore, for better production performance in meat type chicken, supplementation of garlic or ginger paste at 50g/100 kg feed is recommended.

FUTURE SCOPE

Future scope for this experiment can be carried out on the basis of essentiality of phytobiotics in other species of poultry for it is recommendation.

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Conflict of Interest. Nil.

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