# PRODUCTIVE PERFORMANCES AND CARCASS TRAITS OF BROILERS FED DIETS SUPPLEMENTED WITH PHYTASE AND PROTEASE DURING SUMMER SEASON

Mohammad Y. Miah[1]*, AKM R. A. Sarker[2] and Rider A. Perez- Maldonado[3]

[1]Department of Poultry Science, Sylhet Agricultural University, Sylhet - 3100, Bangladesh.

[2]DSM Nutritional Products, Bangladesh.

[3]DSM Nutritional Products, Singapore.

* Corresponding author email: myoumsau2003@gmail.com

## I. INTRODUCTION

Exogenous enzymes supplementation in broiler diets increased dietary protein and mineral utilization through increased substrate availability [1]. The amount of anti-nutritive factors such as protease inhibitors, lectins and phytate present in a corn-soybean meal (SBM) based diet presents an ideal opportunity to use exogenous enzymes. Although many literatures are available on the effects of carbohydrases on dietary energy release and their interaction with phytase [2], data on the effects of protease and protease in combination with phytase are scarce. Supplementation of protease alone in broiler diets has mixed responses [3,4], although consistently increased performance due to phytase addition has been reported [5]. Ghazi et al. [4] found increased nitrogen (N) retention in broiler chickens SBM diets with protease treated. Protease supplementation with lower dietary protein level have no reduction in broiler performance [6]. Supplemental phytase has been observed to increase the activity of pepsin, H+ K+ ATPase, trypsin and aminopeptidase [7]. Ravindran *et al.* [8] stated that N retention increased in broiler chickens fed supplemental phytase, independent of dietary phytic acid and non-phytate phosphorus levels. Hence the effects of exogenous protease and phytase combination (PP) in broiler diets on dietary nutrient utilization and carcass traits of Broilers under heat stress needs to be investigated.

## II. MATERIALS AND METHODS

The study was carried out in the experimental pens of an open-sided shed at Sylhet Agricultural University. A total of 1000 day-old broiler chicks (Cobb 500) were randomly allocated into eight dietary treatments with five replicates per treatment and 25 broilers per replication. All diets were corn–soybean meal based. Dietary treatments were $T_1$: is the Positive control (PC) diet formulated to match Cobb breeder recommendations, 2016. $T_2$: is the Negative control (NC1) diet, as PC with reduced Ca (0.18%) and AvP (0.15%). $T_3$ (Negative control 2): as NC1 with reduced CP and AAs (4%) as matrix calculator $T_4$: as NC2 with CP and AAs except (no reduced) Arginine, $T_5$: is the NC1 + 200 ppm phytase. $T_6$: is NC2 + 200 ppm phytase + 200 ppm protease. $T_7$: is the NC3 + 200 ppm phytase + 200 ppm protease. $T_8$: is the NC3 + 200 ppm phytase + 200 ppm protease + 200 mg/kg of Stay C (Vitamin C) + 100 mg/kg Vitamin E supplements. Diets and drinking water was offered ad libitum. Body weight, feed consumption, FCR and survivability were recorded. After processing the dressed weight, the weight of breast meat, thigh meat, drumstick meat and wing were was recorded. Data were analyzed statistically using analysis of variance (ANOVA) in a completely randomized design followed by determining least significant difference (LSD) (SAS 2008).

## III. RESULTS AND DISCUSSION

Body weight and body weight gain was significantly increased in PC, NC1+ 200 ppm phytase, NC2+ 200 ppm phytase + 200 ppm protease, NC3+ 200 ppm phytase + 200 ppm protease, NC2+ 200 ppm phytase + 200 ppm protease +Vit E + Vit C diets ($P<0.001$) than for birds of NC1- PC with reduced Ca (0.18%) and AvP (0.15%), NC2- NC1 with reduced CP and AAs as matrix calculator, NC3- NC2 with CP and AAs except (not reduced) Arginine diets at 5 weeks. Survivability was not affected by dietary treatments during the experimental period. Exogenous proteases may enhance endogenous peptidases by increasing protein digestibility and hydrolyzing proteinaceous anti-nutritional factors such as lectins, trypsin inhibitors and antigenic proteins [4]. Hence, increased ileal nutrient digestibility for

chickens fed exogenous protease and phytase combination (PP) may be related to direct effects on the digestion of nutrient substrates as well as reduced endogenous loss.

Table 1. Effect of protease and phytase on performance of Broilers under heat stress

| Variables (g/chick) | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | SEM | P value |
|---|---|---|---|---|---|---|---|---|---|---|
| Day old body weight (g/b) | 45.2 | 45 | 45.2 | 44.9 | 45.1 | 45.1 | 45.1 | 45.3 | 0.078 | 0.966 |
| Body weight 35 day(g/b) | 1776$^{a}$ | 1603$^{b}$ | 1559$^{b}$ | 1578$^{b}$ | 1787$^{a}$ | 1789$^{a}$ | 1766$^{a}$ | 1788$^{a}$ | 18.13 | 0.000 |
| Weight gain (g/b/d) | 49.5$^{a}$ | 44.5$^{b}$ | 43.3$^{b}$ | 43.8$^{b}$ | 49.7$^{a}$ | 49.8$^{a}$ | 49.2$^{a}$ | 49.8$^{a}$ | 0.52 | 0.000 |
| Feed intake 35 day (g/b) | 2915$^{ab}$ | 2836$^{bc}$ | 2794$^{b}$ | 2844$^{bc}$ | 2971$^{a}$ | 2938$^{ab}$ | 2902$^{ab}$ | 2934$^{ab}$ | 13.46 | 0.004 |
| FCR (0-35day) | 1.64$^{b}$ | 1.77$^{a}$ | 1.79$^{a}$ | 1.80$^{a}$ | 1.66$^{b}$ | 1.64$^{b}$ | 1.64$^{b}$ | 1.64$^{b}$ | 0.014 | 0.000 |
| Survivability % | 99.4 | 98.8 | 99.2 | 99.2 | 99.4 | 99.6 | 99.6 | 99.6 | 0.084 | 0.213 |

T1: Positive control (PC), T2: PC with reduced Ca (0.18%) and AvP (0.15%) ($NC_1$), T3: $NC_1$ with reduced CP and AAs as matrix calculator ($NC_2$), T4: NC2 with CP and AAs except (no reduced) Arginine, T5: $NC_1$+ 200 ppm phytase ($NC_3$), T6: $NC_2$+ 200 ppm phytase + 200 ppm protease, T7: $NC_3$+ 200 ppm phytase + 200 ppm protease, T8: $NC_2$+ 200 ppm phytase + 200 ppm protease + Vit E (100 mg/kg) + Vit C (200 mg)

Table 2. Effect of protease and phytase on carcass traits of Broilers under heat stress

| Variables (g/chick) | T1 | T2 | T3 | T4 | T5 | T6 | T7 | T8 | SEM | P value |
|---|---|---|---|---|---|---|---|---|---|---|
| Live weight(g) | 1793 | 1632 | 1695 | 1745 | 1624 | 1668 | 1816 | 1739 | 16.99 | 0.120 |
| Dressing % | 71.3 | 69.3 | 69.4 | 71.4 | 69.4 | 70.3 | 71.4 | 70.9 | 0.25 | 0.102 |
| Breast meat % | 21.3$^{a}$ | 20.3$^{ab}$ | 20.5$^{ab}$ | 19.6$^{b}$ | 21.3$^{a}$ | 21.5$^{a}$ | 21.3$^{a}$ | 21.1$^{a}$ | 0.16 | 0.010 |
| Thigh meat % | 14.4 | 14.5 | 14.0 | 13.7 | 14.0 | 14.3 | 13.8 | 14.1 | 0.09 | 0.231 |
| Drumstick meat % | 9.4 | 9.4 | 9.1 | 8.9 | 9.4 | 9.6 | 9.5 | 9.5 | 0.09 | 0.732 |

While dressing yield was similar in all dietary groups, there was an increasing trend in breast meat weight with supplementation of protease and phytase in the diet. No effect of protease and phytase on thigh meat and drumstick meat was apparent.

## IV. CONCLUSION

It can be concluded that the supplementation of protease and phytase, individually or in combination, increased growth performance and some carcass traits in broilers fed with low protein diets under heat stress condition.

ACKNOWLEDGEMENTS
This research was financially supported by DSM Nutritional Products, Singapore.

## REFERENCES

1. Cowieson, A. & Ravindran, V. (2008). Effect of exogenous enzymes in maize based diets varying in nutrient density for young broilers: growth performance and digestibility of energy, minerals and amino acids. British Poultry Science 49: 37–44.
2. Cowieson, A. & Bedford, M. R. (2009). The effect of phytase and carbohydrase on ileal amino acid digestibility in monogastric diets: complimentary mode of action? World's Poultry Science Journal 65: 609.
3. Marsman, G. J., Gruppen, H., Van Der Poel, A. F., Kwakkel, R. P. & Verstegen, M. W. (1997). The effect of thermal processing and enzyme treatments of soybean meal on growth performance, ileal nutrient digestibilities, and chyme characteristics in broiler Chicks. Poultry Science 76: 864–872.
4. Ghazi, S., Rooke., J, Galbraith, H. & Bedford, M. (2002). The potential for the improvement of the nutritive value of soyabean meal by different proteases in broiler chicks and broiler cockerels. British Poultry Science 43:70–77.
5. Shirley, R. & Edwards, H. (2003). Graded levels of phytase past industry standards improves broiler performance. Poultry Science 82: 671–680.
6. Yu, B., Wu S. T, Liu C. C, Gauthier. R. & Chiou, P. W. S. (2007). Effects of enzyme inclusion in a maize-soybean diet on broiler performance. Animal Feed Science & Technology 134: 283–294.
7. Liu, N., Ru Y. J., Di Li, F., Wang, J. P. & Lei, X. Q. (2009). Effect of Dietary Phytate and Phytase on Proteolytic Digestion and Growth Regulation of Broilers. Archive of Animal Nutrition 63: 292–303.
8. Ravindran, V., Cabahug, S., Ravindran, G., Selle, P. & Bryden, W. (2000). Response of broiler chickens to microbial phytase supplementation as influenced by dietary phytic acid and non-phytate phosphorous levels. Ii. Effects on apparent metabolisable energy, nutrient digestibility and nutrient retention. British Poultry Science 41: 193–200.