# EFFECT OF WATER BASED MIXTURE INFUSION OF *Allium sativum* AND *Withania somnifera* ON PERFORMANCE OF BROILER CHICKS

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**ABSTRACT:** A research study was conducted at Poultry Research unit of Khyber Pakhtunkhwa Agricultural University Peshawar, Pakistan to explore the effect of different levels of water based mixture infusion of *Allium sativum* and *Withania somnifera* on overall performance of broiler chicks. For this purpose 120 day old chicks were divided into four groups designated as A, B, C and D with three replicate having 10 chicks each. All chicks were reared in separate pens for 35 days in an open sided house. Group A was kept control while chicks in group B, C and D received water based infusion at rate of 5, 7.5 and 10 ml/L of drinking water respectively. Mean feed intake, water intake and weight gain was found significantly higher ($P<0.05$) with better feed conversion ratio (FCR) in group C and D. Significantly higher dressing percentage was recorded in group D as compared to all other groups. It is concluded that water based infusion of *Withania sominefera* and *Allium Sativum* in 1:6 ratio mixture at the rate of 10 ml/L of water improved the overall performance of broiler chicks.

**Key word:** *Allium Sativum*, *Withania somnifera*, feed intake, feed conversion ratio, weight gain.

## INTRODUCTION

Poultry industry is the second leading industry in Pakistan after textile. It contributes 33% of the total meat production of the country and generates employments for about 1.5 million people (Economic survey of Pakistan, 2011).

Although antibiotics are usually added to poultry feed as additives, but their drug residual effects through meat and egg are the major concerns regarding human health. The use of antibiotics as growth promoter in animals raised for food is highly controversial (Phillips *et al*., 2004). The World Health Organization and other Public Health Agencies have shown concerns on growth promoter antibiotics by arguing that their use leads to increased antibiotic-resistant infections in humans. Whereas, the commercial sectors have reservations that their removal may result in increased cost of production (Smith, 2002; Casewell *et al*., 2003)

Medicinal plants as natural feed additives are recently used in poultry diet to enhance the performance and immune response of chicken (Abaza *et al*., 2008; Tanweer *et al*., 2012). Medicinal plants found widely throughout the world including Pakistan contains innumerable active compounds responsible for reduction of harmful diseases through enhancement of immune system as well as removal of toxic substances from the body.

Garlic (*Allium Sativum)* is used to treat the symptoms of acne and it can manage high cholesterol levels (Qureshi *et al*., 1983). Its paste in the diets of laying hens reduced serum and yolk cholesterol concentrations (Chowdhary *et al.* 2002). Garlic is antimicrobial (Gupta *et al*. 2005). It has been investigated that addition of garlic powder to poultry diet increased egg weight and decreased egg yolk cholesterol concentration (mg/g yolk), serum triglyceride and cholesterol concentrations without adverse effect on the performance and egg weight. (Yalcan *et al*. 2006)

*Withania somnifera* (L. Dunal) has hypoglycemic, diuretic, hypocholesterolemic (Andallu and Radhika, 2000), anticoccidal (Das *et al*. 2001) and growth promoting properties (Ziauddin *et al*., 1996).

Keeping in view the importance of *Allium sativum* and *Withania somnifera*, present study was therefore conducted to evaluate the effect of water based infusion of these plants on overall performance of broiler chicks.

## MATERIALS AND METHODS

Present study was conducted to explore the potentials of infusion of *Allium sativum* and *Withania somnifera* mixture in broiler chicks at Pakhtunkhwa Agricultural University Peshawar poultry farm.

**Experimental design:** A completely randomize design was used to carry out the study. One hundred and twenty (120), day-old broiler chicks were purchased from local market. The chicks were randomly distributed into four groups A, B, C and D. Each group consisted of three replicate and each replicate had 10 chicks. The water based infusion was given at @ 5, 7.5 and 10 ml/L of water to group B, C and D respectively, while group A was kept as a control. All the chicks were reared in

separate pens in an open sided house under similar environmental condition. The experiment was continued till day-35 and relevant data were recorded throughout the experiment.

**Preparation of infusion:**For the preparation of infusion 5g of *Allium sativum* and 30g of *Withania somnifera* powder were kept in one liter of boiling water over night. At next morning the suspension was filtered through Watman filter paper No. 4. Fresh infusion was prepared on daily basis.

**Parameters:** Daily and cumulative feed and water intake was determined by offering known amount of feed and water and measuring the refusal.

Feed intake = Feed offered – Feed refused.

Water intake = Water offered – Water refused

Body weight gain was calculated on weekly basis and total body weight gain was calculated at the end of experiment.

Body weight gain = Final weight – Initial weight

Feed conversion ratio (FCR) was calculated at the end of experiment by using the following formula.

FCR = Feed Intake/ Weight gain

On the last day of study, three birds from each replicate were live weighed and slaughtered. Head, feet, all internal visceral organs, including abdominal fat were removed and then the dressed body was weighed. The dressed body weight was expressed in terms of dressing percentage.

Dressing percentage = Dressed weight / Live weight x 100

**Statistical analysis:** The data recorded for all the parameters, were statistically analyzed by the standard procedure of analysis of variance, using Completely Randomized Design (CRD) as described by Steel et al., (1997). The statistical package SAS (1997) was used to perform the analysis.

## RESULTS AND DISCUSSION

**Feed and water intake:** Mean feed and water intake of the four treatments groups A, B, C and D is presented in Table 1. Analysis of variance indicated significant ($P<0.05$) difference in the four treatment groups. Significantly higher feed and water intake was observed in group D receiving higher quantity of infusion.

The better feed intake in the broiler chicks feeding water based infusion might be due to the availability of water based fraction of *Allium sativum* and *Withania somnifera* constituents like acillin and withanoids. These fractions may help to enhance the activities of gut (GIT) microflora of the birds. Findings of our results are similar to Guo *et al*. (2004) who reported significant increase in feed intake by Chinese herbal medicines. Similar results were reported by Ademola *et al.* (2004) who used garlic and ginger extract.

**Table 1. Effect of different levels of water based infusion of *Allium sativum* and *Withania somnifera* on mean feed and water intake (g) in broiler chicks.**

| Groups | Feed intake | | Water intake | |
|---|---|---|---|---|
| | Mean | CV % | Mean | CV % |
| A | 2954.00$^{c}$ | 5.72 | 4773.3$^{c}$ | 3.26 |
| B | 3293.17$^{b}$ | 6.48 | 5978.67$^{b}$ | 3.95 |
| C | 3560.00$^{a}$ | 4.57 | 6340.00$^{a}$ | 1.82 |
| D | 3752.33$^{a}$ | 2.04 | 6541.67$^{a}$ | 3.87 |

Mean in the column with different superscripts are significantly different at $\alpha = 0.05$

**Body weight gain:** Weekly and total weight gain of broiler chicks is presented in Table 2. Water based infusion affected body weight gain at all recorded stages. Body weight gain was significantly ($P<0.05$) higher in group D at all recorded stages. Group C performed similar to group B on day-21, -28 and -35. Over all weight gain was significantly ($P<0.05$) higher in group D as compared to all other groups.

**Table 2. Effect of different levels of water based infusion of *Allium sativum* and *Withania somnifera* on mean weight gain (g) in broiler chicks**

| Group | Age | | | | Total body weight gain |
|---|---|---|---|---|---|
| | Day-14 | Day-21 | Day-28 | Day-35 | |
| A | 225.15$^{d}$ | 360.25$^{b}$ | 439.96$^{c}$ | 528.19$^{b}$ | 1553.55$^{d}$ |
| B | 225.26$^{c}$ | 386.69$^{b}$ | 512.54$^{b}$ | 529.52$^{b}$ | 1654.01$^{c}$ |
| C | 265.35$^{b}$ | 426.14$^{a}$ | 547.64$^{a}$ | 552.28$^{a}$ | 1791.41$^{b}$ |
| D | 305.36$^{a}$ | 429.38$^{a}$ | 568.34$^{a}$ | 593.15$^{a}$ | 1896.23$^{a}$ |

Means within column with different superscripts are significantly different at $\alpha = 0.05$

Mahmood *et al*. (2009) reported that *A. sativum* and *N. sativum* had positive effect on the growth rate, relative weight of giblets and dressing percentage. The presence of antibiotic substances in garlic (allicin) is responsible for the improvement of weight gain which may prevent the growth of aflatoxin producing fungus and pathogenic microorganism (Meraj, 1998). Lewis *et al*. (2003) in their experiment observed significant body weight gain in broiler chicks by mixture of medicinal plants (Milk thistle, garlic and orange).

**Feed conversion ratio (FCR):** Mean feed conversion ratio is presented in Table 3. Mean feed conversion ratio (FCR) was significantly affected by water based infusion of *Allium sativum* and *Withania somnifera* at all stages except days 14 and 35 and was the best in group C and D as compared to the control group.

**Table 3. Effect of different levels of water based infusion of *Allium sativum* and *Withania somnifera* on mean feed conversion ratio (FCR) in broiler chicks.**

| Group | Age | | | | Overall |
|---|---|---|---|---|---|
| | Day-14 | Day-21 | Day-28 | Day-35 | FCR |
| A | 2.21 | 2.25[a] | 2.13[a] | 2.18 | 2.17[a] |
| B | 2.21 | 2.18[ab] | 2.24[b] | 2.09 | 2.18[a] |
| C | 1.79 | 1.89[b] | 1.91[b] | 2.04 | 1.90[b] |
| D | 1.82 | 1.86[b] | 1.87[b] | 1.96 | 1.87[ba] |

Mean within the same column with different superscripts are significantly different at $\alpha = 0.05$

*A. sativum* protects the gastrointestinal tract from pathogenic bacteria which increase metabolic rate and feed conversion ratio (Zeybek *et al*., 2007). The better FCR in group D receiving infusion in highest quantity might be due to the antiparasitic activities of garlic (Zener *et al*., 2003). Findings of Chowdhary *et al*. (2002) and Konjufca *et al.* (1997) are contrary to our finding who reported that garlic paste has no influence on FCR of laying hen and Ross chicken respectively.

**Dressing percentage:** Average dressing percentage for the four treatment groups is presented in Table 4. Analysis of variance indicated significant difference ($P<0.05$) among the treatment groups. Significantly high dressing percentage was observed in group D as compared to all other groups.

**Table 4. Effect of different levels of water based infusion of *Allium sativum* and *Withania somnifera* on mean dressing percentage of broiler chicks**

| Group | Mean | CV % |
|---|---|---|
| A | 58.67[b] | 1.01 |
| B | 57.86[b] | 2.55 |
| C | 54.93[c] | 3.09 |
| D | 63.86[a] | 3.07 |

Mean in the column with different superscripts are significantly different at a=0.05

Similar to the present findings significant increase ($p>0.05$) in dressing percentage was reported by Javed *et al*. (2009) while working on mixture of plants in broiler. Mahmood *et al*. (2009) evaluated the growth promoting effect of *A.Sativum* on growth rate and relative weights of giblets and dressing percentage in broiler chicks. In series of their experiments they observed no significant effect on dressing percentage of broiler chicks in treated and control groups.

**Economic evaluation:** The economic evaluation of the study showed that maximum profit per bird has been achieved with the increased intake of *Allium sativum* and *Withania Somnifera* infusion, as it is effective in the body weight gain of the birds and reducing feed conversion ratio as shown in Table 2 and Table 3. These results are supported by the studies of Jahan Zeb *et al*. (2008), Narahari (1995) and Prajapati (1997) as they also reported extra profit per bird after using these plants. Nidaullah *et al*. (2010) and Shahriyar and Durrani (2006) also concluded increase in profit per bird after using these medicinal plants. Sultan Mehmood *et al*. (2009) also showed the extra profit per bird when he used these plants

## REFERENCES


Abaza, I. M., M. A. Sheheta., M. S. Shoeb, and I. I. Hassan. Evaluation of some natural feed additive in growing chicks diets. Int. J. Poul. Sci. 7 (9): 872-879 (2008).

Ademola, S. G. Growth, hematological and biochemical studies on garlic and ginger-fed broiler chicken. Moor. J. Agri. Res. 5(2): 122-128 (2004).

Andallu, B. and B. Radhika. Hypoglycemic, diuretic and Hypocholesterolemic effect of winter cherry (*Withania somnifera*, Dunal) root. Ind. J. Exp. Biol. 38(6):607-609 (2000).

Casewell M., C Friis, E. Marco, P. McMullin, I. Phillips. The European ban on growth-promoting antibiotics and emerging consequences for human and animal health. J Antimicrob Chemother 2003;52:159-61.

Chowdhury, S. R, S. D. Chowdhury and T. K. Smith. Effect of dietary garlic on cholesterol metabolism in laying hen. J. Poult Sci. 7(2): 122-128 (2002).

Das, K., N. Panda and D. N. Panda. Synergistic effect of herbal immunostimulant "Immu-21", and anticoccidials-IHP-250C and ACC-7 against induced *Eimeria tenella* infection in broiler chicks. J. Phytomedica. 2 (1/2): 77-83 (2001).

Economic survey of Pakistan. Ministry of Food, Agriculture and Livestock, Govt. of Pakistan, Islamabd, livestock and poultry (2011).

Guo, F. C., R. P. Kwakkel., J. Soede., B. A. Williams and M. W. Verstegen. Effect of a Chinese herb medicine formulation, as an alternative for antibiotics, on performance of broilers. J. Br. Poult. Sci. 45(6):793-797 (2004).

Gupta, Y. K. and M. Sharma. Reversal of pyrogallol-induced delay in gastric emptying in rats by ginger (*Zingiber officinale*). Methods. Find. Exp. Clin. Pharmacol (2001).

Jahan Zeb Ansari, Ahsan ul Haq, Muhammad Yousaf, Tanveer Ahmad and Sarzamin Khan" Evaluation of Different Medicinal Plants As Growth Promoters For Broiler Chicks" Sarhad J. Agric. Vol.24, No.2, 323-329 (2008).

Javed, M., F. R. Durrani., A. Hafeez., R. U. Khan and I. Ahmad. Effect of aqueous extract of plant mixture on carcass quality of broiler chicks. ARPN J. Agri and Bio Sci. 4(1): 37-40 (2009).

Konjufca, V. H., G. M. Pesti and R. I. Bakalli. Modulation of cholesterol levels in broiler meat by dietary garlic and copper. J. Polt. Sci. 76: 1264-1271 (1997).

Lewis, M. R., S. P. Rose., A. M. Mackenzie and L. A. Tucker. Effect of dietary inclusion of plant extract on the growth performance of male broiler chicken. Brit. Poult. Sci. 20(9): 78-82 (2003).

Mahmood, S., M. M. Hassan, M. Alam, and F. Ahmad, Comparative efficacy of *Nigella sativa* and *Allium sativum* as growth promoters in broilers. *Int.* J. Agric. Biol., Vol. 11, No. 6, 775-778(2009).

Mahmood, S., M. Mushtaq-Ul-Hassan., M. Alam and F. Ahmad. Comparative Efficacy of Nigella sativa and Allium sativum as Growth Promoters in Broilers. Int. J. Agri & Bio. 11: 775–778 (2009).

Meraj, I. C. A. Effect of garlic and neem leaves supplementation on the performance of broiler chickens. M. Sc. Thesis, Department of Poultry Science, University of Agriculture, Faisalabad, Pakistan (1998).

Narahari, D. Performance promoting ability of LivfitÒ in broilers. Poult. Guide. Sep-Oct: 13-14 (1995).

Nidaullah H., F. R. Durrani, S. Ahmad, I. U. Jan and S. Gul. Aqueous Extract from Different Medicinal Plants As Anticoccidial, Growth Promotive And Immunostimulant In Broilers ARPN Journal of Agricultural and Biological Science VOL. 5, NO. 1,53-59 (2010).

Phillips I., M. Casewell, T. Cox, B. D. Groot, C. Friis, R. Jones, et al. Does the use of antibiotics in food animals pose a risk to human health? A critical review of the published data. J Antimicrob Chemother 2004;53:28-52.

Prajapati, K. S. Effect of dietary supplementation of Livfit vet® premix on performance of broilers. Ind. J. Poult. Sci. 32(1): 86-88 (1997).

Qureshi, A. A., Z. Z. Din, N. Abuirmeileh, W. C. Burger, Y. Ahmad. and C.E. Elson. Suppression of avian hepatic lipid metabolism by solvent extracts of garlic: impact on serum lipids. J. Nutr. 113(9):1746-1755 (1983).

SAS Institute. SAS User's Guide: Statistics. SAS Institute, Inc., Cary, NC (1997).

Shahriyar and F. R. Durrani. Effect of different level of Garlic infusion on the overall performance, lipid profile and immunity of broiler chicks. MSc (Hons) Thesis. NWFP Agricultural University, Peshawar (2006).

Smith, J. A. The future of poultry production in the USA without antibiotics. Poultry International 2002;41:68-9.

Steel, R. G. D., J. H. Torrie and D. A. Dickey. Principles and procedures of statistics: A biometrical approach. 3rd. Ed. McGraw-Hill, Singapore (1997).

Tanweer, A. J., N. Chand, S. Khan, M. S. Qureshi, A. Akhtar and M. Niamatullah. Impact of methanolic extract of *Peganum harmala* on the weight gain, feed conversion ratio, feed cost and gross return of broiler chicks. The J. Anim. Plant Sci. 22 (2): 264-267 (2012)

Yalcin, S., E. E. Onbasalar, Z. Reisli and Suzan. Effect of garlic powder on the performance, egg traits and blood parameters of laying hens. J. Sci. Food. Agri. 86(9): 1336-1339 (2006).

Zeybek, Y. K. and M. Sharma. Reversal of pyrogallol-induced delay in gastric emptying in rats by garlic. Methods. Find. Exp. Clin. Pharmacol (2007).

Ziauddin, M., N. Phansalkar, P. Patki, S. Diwanay and B. Patwardhan. Studies on the immunomodulatory effects of Ashwagandha. J. Ethnopharma. 50: 69-76 (1995).