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Use of Garlic (*Allium sativum*), Black Cumin Seeds (*Nigella sativa* L.) and Wild Mint (*Mentha longifolia*) in Broiler Chickens Diets

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Abstract: This experiment was conducted for comparison, the effect of garlic powder, black cumin seeds powder and wild mint powder on performance and carcass characteristics of broiler chickens. Based a randomized completely design, 320 days old Ross 308 broilers were distributed into 16 floor pens and reared for 42 days. A basal diet was formulated according to NRC recommendations for starter (0-21 days) and grower (22-42 days) periods. The basal diet was also supplemented with garlic powder, black cumin seeds powder and wild mint powder, resulting 4 dietary treatments were prepared including control group. Each dietary treatment was fed *ad-libitum* to 4 replicates group of 20 birds at the bigining of rearing period. There were no significant differences in feed consumption at all of treatments in rearing period ($p>0.05$). The birds fed the diet containing black cumin seeds powder had the highest body weight gain as compared with other treatments ($p<0.05$). The best Feed Conversion Ratios (FCR) was recorded with birds fed diets contained black cumin seeds powder compared with control and other groups through all growing periods ($p>0.05$). The lowest ($p<0.05$) abdominal fat percent were recorded for broilers fed the diets supplemented with garlic powder and black cumin seeds powder ($p<0.05$). Also, the highest carcass percent were recorded for birds fed diets supplemented with black cumin seeds powder and garlic powder ($p<0.05$). The percent of breast in birds received black cumin seeds powder significantly was higher than wild mint and control groups ($p<0.05$). The percent of thigh was not affected with feed treatments ($p>0.05$).

Key words: Broiler, garlic, black cumin seeds, wild mint, performance, carcass

INTRODUCTION

Feed is the major segment of cost of production in poultry industry. Efforts have been made since the very beginning of poultry industry to increase the efficiency of feed utilization to minimize per unit cost of production. In view of the ban on antibiotic that were previously and still in most of developing countries are used as growth promoters, poultry scientists today are challenged to find out new alternatives to these synthetic growth promoters that could be as or more effective to keep the poultry gut healthy and well balanced with normal micro flora that is recognized as a fundamental precondition for cost efficient and environmentally sound poultry production. Medicinal plants and herbs found in nature are mostly utilized for treatment and curative purposes by human beings since long. The active constituents in leaves, stem, seeds and roots barks of these medicinal plants are highly effective to combat different diseases and improve the digestion that in turn could improve the performance of the recipients. Garlic (*Allium sativum*) is well known as a spice and herbal medicine for the prevention and treatment of a variety of diseases (Adibmoradi *et al*., 2006). The major active ingredients of garlic are allicin, ajoene, S-allyl cysteine. Garlic has been found to demonstrate antimicrobial activity (Adibmoradi *et al*., 2006), lower serum and liver cholesterol (Qureshi *et al*., 1983) and improve productive performance of broiler chicks (Demir *et al*., 2003). black cumin seeds (*Nigella sativa* L.) is one of the most popular plants used in this field. The composition and properties of cumin seeds seeds have been fairly investigated and the results of these investigations were reviewed (Houghton *et al*., 1995; El-Alfy *et al*., 1975; Mahfouz and El-Dakhakhny, 1960). These researchers reported that cumin seeds, or their extracts have anti-microbial, anti-histaminic, anti-tumour, anti-hypertensive and anti-inflammatory effects.Wild Mint (*Mentha longifolia*) known as horse or habek mint is often used in domestic herbal remedy, being valued especially for its antimicrobial, antiseptic,

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antispasmodic, choleretic, carminative and central nervous system stimulant properties and its beneficial effects on the digestion (Chopra *et al*., 1986). The major compounds are carvone (67.3%), limonene (13.5%), I, 8-cineole (5.4%), menthone (2.9%), linalool (2.8%) and isomenthone (1.2%) that exhibit strong antibacterial and antioxidant activities (Younis *et al*., 2004). The present study aimed to comparing the effect of adding garlic powder, black cumin seeds powder and wild mint powder in diets on boilers performance.

MATERIALS AND METHODS

Bird and diet: In this study, 320 broiler chickens of the commercial Ross 308 strain were used in a randomized completely design with 4 treatment and 4 replicates in each treatment and 20 birds/replicates and reared on the floor pens for 42 days. A basal deit was formulated as control according to NRC (1994) recommendations for starter (0-21 days) and grower (22-42 days) periods. The required amount of growth stimulating additives under study was added to the basal diet so that, in addition to the control treatment, four dietary experimental treatments containing garlic powder (1000 g ton^{-1}), black cumin seeds powder (1000 g ton^{-1}) and wild mint powder (1000 g ton^{-1}) were prepared (Table 1). During the experiment, water and feed were given to the birds *ad-libitum*.

Sample collection: Weighing of the feed and chickens were made on a weekly basis. At the end of the experiment, 2 birds from each replicate of treatments were slaughtered for separation of carcasses (Perreault and Leeson, 1992).

Table 1: Ingredient composition (dry matter (%)) and calculated analysis of the basal diets

Ingredients	Starter (0-21 days)	Grower (22-42 days)
Corn	58.07	63.25
Soybean meal	27.12	21.52
Cotton meal	10.00	10.00
Soybean oil	1.16	1.75
Ground limestone	1.17	1.34
DCP	1.34	1.13
Salt	0.40	0.32
Vitamin and Mineral premix	0.50	0.50
Coccidiostat	-	0.04
Vitamin E	0.03	0.03
DL- Methionine	0.11	0.04
L-lysine	0.10	0.08
Nutrient content		
ME (kcal kg^{-1})	2850.00	2950.00
Crude protein (%)	20.48	18.44
Crude fiber (%)	4.37	4.10

Vitamin and mineral provided/kilogram of diet: Vitamin A, 360000 IU; vitamin D3, 800000 IU; vitamin E, 7200 IU; vitamin K3, 800 mg; vitamin B1, 720 mg; vitamin B9, 400 mg; vitamin H2, 40 mg; vitamin B2, 2640 mg, vitamin B3, 4000 mg; vitamin B5, 12000 mg; vitamin B6, 1200 mg; vitamin B12, 6 mg; Choline, 200000 mg, Manganese, 40000 mg, Iron, 20000 mg; Zinc, 40000 mg, copper, 4000 mg; Iodine, 400 mg; Selenium, 80 mg

Statistical analysis: All data were analyzed using the one-way ANOVA procedure of SAS® (1998) for analysis of variance. Significant differences among treatments were identified at 5% level by Duncan (1955) multiple range tests.

RESULTS AND DISCUSSION

Growth performance: The effect of experimental treatments on the performance of broiler chickens is given in Table 2. Feed consumption did not differ between treatments ($p>0.05$). The body weight gain was significantly increased for birds fed black cumin seeds powder comparded to control group ($p>0.05$). From 0-42 days of age, Feed Conversion Ratios (FCR) was improved significantly by supplementation with black cumin seeds powder compared to other groups ($p<0.05$). In starter period (0-21 days) the black cumin seeds powder showed a better FCR than wild mint powder and control groups ($p<0.05$).

In summary, supplementation of the diet with black cumin seeds powder significantly improved body weight gain and feed conversion ratio. Guler *et al*. (2006), Abu-Dieyeh and Abu-Darwish (2008) and Al-Beitawi and El-Ghouseinet (2008) reported that black cumin seeds powder can improve the performance of birds, which was in contrast to those of Osman and El-Barody (1999).

The data of present study show that dietary garlic and wild mint powder can not affect the growth performance of broiler chickens. The results was consistent with Dey and Samanta (1993) who reported that supplementation of garlic powder in diet had no significant effect on weight gain and feed conversion ratio. In the other hand, Shi *et al*. (1999) and Al-Ankari *et al*. (2004), observed a positive effect of garlic powder and wild mint powder on broiler performance, respectively.

Variance among reports of researchers could be related to differences in management and environmental conditions that be exist in various experiments. It's suggested that under benefit management and/or environmental conditions, the effect of such feed additives may be worthless. The positive effect of supplementation with black cumin seeds powder on performance may be due to rich nutrients content of unsaturated and essential fatty acids, essential amino acids and carotene in the black cumin seeds. It is also a source of calcium, iron, sodium and potassium that are considered essential cofactors in various enzyme functions (Takruri and Dameh, 1998; Tierra, 2006; Salma *et al*., 2007). In addition, there are other pharmacologically positive effects of black cumin seeds

Table 2: The main effects of treatments on performance of broiler chickens (Mean±SE)

	Feed consumption (g)		Body weight gain (g)		Feed conversion ratio (g g^{-1})	
Treatments	0-21	0-42	0-21	0-42	0-21	0-42
Control	1146.27	4206.07	472.70^{b}	1846.25^{b}	2.43^{a}	2.28^{a}
Black cumin seeds	1070.32	4199.14	658.16^{a}	2330.66^{a}	1.63^{b}	1.83^{b}
Wild mint	1177.01	4218.31	495.15^{b}	1987.01^{ab}	2.37^{a}	2.12^{ab}
Garlic	1187.98	4268.06	559.54^{ab}	2062.48^{ab}	2.14^{ab}	2.06^{ab}
SEM	43.80	53.68	27.04	73.47	0.12	0.06
p-value	0.82	0.97	0.03	0.09	0.07	0.08

^{a,b}: Means in each column with different superscripts are significantly different ($p<0.05$)

Table 3: The effect of herbal additives on carcass composition of broiler chickens

Variables	Treatments					
As %	Control	Black cumin seeds	Wild mint	Garlic	SEM	p-value
Carcass	77.21^{b}	82.14^{a}	89.08^{b}	82.32^{a}	0.63	0.0004
Thigh	32.79	31.59	28.95	32.49	0.88	0.4300
Breast	31.60^{bc}	36.77^{a}	28.33^{c}	35.98^{ab}	1.12	0.0080
Abdominal fat	1.57^{a}	0.99^{b}	1.48^{a}	1.02^{b}	0.07	0.0001

^{a,b,c}: Means in each row with different superscripts are significantly different ($p<0.05$)

on growth performance of broiler birds, which may also be attributed to its content of volatile oil (Hay and Waterman, 1993) or essential oil (Oyen and Dung, 1999). It has been shown that, the essential oil of black cumin seeds has certain biological functions that could act not only as antibacterial, anti-oxidants (Al-Harthi, 2004), but also as a stimulant of digestive enzymes in the intestinal mucosa and pancreas that improve the digestion of dietary nutrients and feed efficiency, subsequently increasing the growth rate (Platel and Srinivasan, 1996; Lee *et al*., 2004).

Carcass composition: The effects of experimental treatments on carcass composition of broiler chickens are reported in Table 3. The birds under black cumin seeds powder and garlic powder treatments had the highest percent carcass ($p<0.05$). Similarly, the birds under black cumin seeds powder and garlic powder treatments had the lowest abdominal fat percent than other groups ($p<0.05$). The experimental treatments had no significant effect on the percent of thigh ($p>0.05$). Also, birds under black cumin seeds powder treatment had the highest breast percent as compared with other treatments ($p<0.05$).

The positive effect of the black cumin seeds powder use on the percent of broiler carcasses (Guler *et al*., 2006) confirm the results of this experiment. In the Abaza *et al*. (2008) study, adding 0.1% black cumin seed oil to the birds' ration, decreased the percent of abdominal fat. However, our findings on carcass characteristics were in contrast to those of Guler *et al*. (2006), Javandel *et al*. (2008) and Durrani *et al*. (2007).

CONCLUSION

The results of this study indicated that feeding growing chicks on diet containing natural feed additives as black cumin seeds powder improved chicks performance, digestibility and decreased abdominal fat compared to the control group. Further researches are needed to get better understanding of the effect of natural feed additives in poultry production and their beneficial impact on human health.

REFERENCES

Abaza, I.M., M.A. Shehata, M.S. Shoieb and I.I. Hassan, 2008. Evaluation of some natural feed additive in growing chicks diets. Int. J. Poult. Sci., 7 (9): 872-879. http://www.scialert.net/qredirect.php?doi=ijps.2008.872.879&linkid=pdf.

Abu-Dieyeh, Z.H.M. and M.S. Abu-Darwish, 2008. Effect of feeding powdered black cumin seeds (*Nigella sativa* L.) on growth performance of 4-8 week-old broilers. J. Anim. Vet. Adv., 7 (3): 286-290. http://209.85.129.132/search?q=cache:ZiXQUQFq7wwJ:www.medwelljournals.com/fulltext/java/2008/286-290.pdf+Effect+of+feeding+powdered+black+cumin+seeds+(Nigella+sativa+L.)+on+growth+performance+of+4-8+week-old+broilers&cd=1&hl=en&ct=clnk.

Adibmoradi, M., B. Navidshad, J. Seifdavati and M. Royan, 2006. Effect of dietary garlic meal on histological structure of small intestine in broiler chickens. J. Poult. Sci., 43: 378-383. http://www.jstage.jst.go.jp/article/jpsa/43/4/378/_pdf.

Al-Ankari, A.S., M.M. Zaki and S.I. Al-Sultan, 2004. Use of habek mint (*Mentha longifolia*) in broiler chicken diets. Int. J. Poult. Sci., 3 (10): 629-634. http://www.scialert.net/qredirect.php?doi=ijps.2004.629.634&linkid=pdf.

AL-Beitawi, N. and S.S. El-Ghousein, 2008. Effect of feeding different levels of *Nigella sativa* seeds (Black Cumin) on performance, blood constituents and carcass characteristics of broiler chicks. Int. J. Poult. Sci., 7 (7): 715-721. http://www.scialert.net/qredirect.php?doi=ijps.2008.715.721&linkid=pdf.

Al-Harthi, M.A., 2004. Efficiency of utilizing some spices and herbs with or without antibiotic supplementation on growth performance and carcass characteristics of broiler chicks. Egypt. Poult. Sci. J., 24: 869-899. http://www.kau.edu.sa/Show_Res.aspx?Site_ID=155&LNG=EN&RN=21920.

Chopra, R., S.L. Nayar and I.C. Chopra, 1986. Glossary of Indian medicinal plants. Council of Science Industry Research, New Delhi.

Demir, E., S. Sarica, M.A. Ozcan and M. Suicmez, 2003. The use of natural feed additives as alternatives for an antibiotic growth promoter in broiler diets. Br. Poult. Sci., 44 (Suppl. 1): S44-S45. DOI: 10.1080/713655288.

Dey, A. and A.R. Samanta, 1993. Effect of feeding garlic (*Allium sativum* Linn.) as a growth promoter in broilers. Ind. J. Anim. Heal., 32 (1): 17-19.

Duncan, D.B., 1955. Multiple range and F-tests Biometrics., 11: 1-42.

Durrani, F.R., A. Suitan, M.L. Marri, N. Chand and Z. Durrani, 2007. Effect of wild mint (*Mentha longifolia*) infusion on the over all performance of broiler chicks. Pak. J. Biol. Sci., 10 (7): 1130-1133. http://www.scialert.net/qredirect.php?doi=pjbs.2007.1130.1133&linkid=pdf.

El-Alfy, T.S., El-Fatatry and M.A. Toama, 1975. Isolation and assignment of an antimicrobial principle from the volatile of *Niglla sativa* seeds. Phamazia, 30: 109-111.

Guler, T., B. Dalkilic, O.N. Ertas and M. Ciftci, 2006. The effect of dietary black cumin seeds (*Nigella Sativa* L.) on the performance of broilers. Asian-Aust. J. Anim. Sci., 19 (3): 425-430.

Hay, R.K.M. and P.G. Waterman, 1993. Volatile oil crops: Their biology, biochemistry and production. Longman Scientific and Technical, Essex.

Houghton, P.J., R. Zarka, H.B. Delas and J.R.S. Hoult, 1995. Fixed oil of Niglla sativa and derived thymoquinone lipid peroxidation. Planta Medica, 61 (1): 33-36. PMID: 7700988.

Javandel, F., B. Navidshad, J. Seifdavati, G.H. Pourrahimi and S. Baniyaghoub, 2008. The favorite dosage of garlic meal as a feed additive in broiler chickens ratios. Pak. J. Biol. Sci., 11 (13): 1746-1749. http://www.scialert.net/qredirect.php?doi=pjbs.2008.1746.1749&linkid=pdf.

Lee, K.W., H. Evarts and A.C. Beynen, 2004. Essential oils in broiler nutrition. Int. J. Poult. Sci., 3: 738-752. http://scialert.net/qredirect.php?doi=ijps.2004.738.752&linkid=pdf.

Mahfouz, M. and M. El-Dakhakhny, 1960. Some chemical and pharmacological properties of the new anti asthmatic drug Nigellone. Egypt. Pharm. Bull., 24: 411-424.

NRC (National Research Council), 1994. Nutrient Requirements of Poultry. 9th Rev. Edn. National Academy Press, Washington, D.C. http://books.nap.edu/openbook.php?isbn=0309048923.

Osman, A.M.A. and M.A.A. El-Barody, 1999. Growth performance and immune response of broiler chicks as affected by diets density and *Niglla sativa* seeds supplementation. Egypt. Poult. Sci., 19: 619-633.

Oyen, L.P.A. and N.X. Dung, 1999. Essential-Oil Plants. In: Oyen, L.P.A. and N.X. Dung (Eds.). Backhuys Publishhers, Leiden.

Perreault, N. and S. Leeson, 1992. Age-related carcass composition changes in male broiler chickens. Can. J. Anim. Sci., 72: 919-929.

Platel, K. and K. Srinivasan, 1996. Influence of dietary spices or their active principles on digestive enzymes of small intestinal mucosa in rats. Int. J. Food Sci. Nutr., 45: 55-59. PMID: 8616674.

Qureshi, A.A., N. Abuirmeileh, Z.Z. Din, C.E. Elson and W.C. Burger, 1983. Inhibition of cholesterol and fatty acid biosynthesis in liver enzymes and chicken hepatocytes by polar fractions of garlic. Lipids, 18: 343-348. DOI: 10.1007/BF02537229.

Salma, C.R., B. Souhail, H. Basma, B. Christophe, D. Cloude and A. Hamadi, 2007. *Nigella sativa* L.: Chemical composition and physicochemical characteristics of lipid fraction. J. Food Chem., 101: 673-681. DOI: 10.1016/j.foodchem.2006.02.022.

SAS, 1998. SAS/STAT User's Guide: 1998 Edition: SAS Institute Inc., Cary. Nc.

Shi, X.H., S.Z. Li, Z.P. Liu, X.H. Shi, S.Z. Li and Z.P. Liu, 1999. A trial on the use of garlic as a feed additive for meat chickens. Poult. Husbandry Dis. Control, 10: 19-20.

Takruri, H.M.H. and M.E.F. Dameh, 1998. Study of the nutritional value of black cumin seeds (*N. sativa* L.). J. Food Agric. Sci., 76: 404-410. http://www3.interscience.wiley.com/cgi-bin/fulltext/61002045/PDFSTART.

Tierra, M., 2006. Chemical analysis of black cumin. African Red Tea Imports. http:www.africanredtea.com/organic-black-cumin-seed.html.

Younis, M.H., Younis, Basher and M. Shadia, 2004. Carvone-rich essential oils from *Mentha longifolia* Huds.ssp. Schimperi Briq and Mentha spicata grown in sudan. J. Essen. Oils Res., 86: 212-216.