J. Agric. Sci. Mansoura Univ., 30 (9): 5093 - 5102, 2005

RESPONSE OF GROWING TURKEYS TO SUPPLEMENTATION OF DIFFERENT TYPES AND LEVELS OF NATURAL FEED ADDITIVES

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ABSTRACT

The objective of this experiment was to evaluate the response of turkey poults to different types and levels of natural feed additives (NFA) such as hot or black pepper and canella feed at levels 0.2 or 0.4% considering growth performance, carcass traits, blood parameters and the economic efficiency.

A total number of 168 unsexed eight-weeks- old Broad Breasted Bronze turkey poults were randomly distributed to seven treatment groups of 24 birds each. Each group contained 3 replicates, of 8 birds per replicate. Then, initial live body weight among replecats as well as treatments was nearly similar. The first group served as control, while the other groups were assigned on one of two levels of tested NFA.

Data revealed that adding NFA i.e, hot or black pepper or canella to the control diet significantly improved live body weight, body weight gain and feed intake while, decreased feed conversion efficiency as compared to those fed the control. Results indicated a significant decrease in dressing, heart and gizzard percentages of turkey poults the supplemented NFA as compared to those fed the control diet. dier plasma total protein, albumin globulin contents were significantly increased when hot pepper was fed at 0.4%, while plasma total lipids significantly decreased. Either hot or black pepper and canella had no adverse effect either on plasma cholesterol or alkaline phosphatase.

It is concluded that using hot paper or canella at 0.2 or 0.4% may enhance the productive performance with no adverse effects on blood parameters of turkey poults.

INTRODUCTION

Recently, there is an increased demand for using some herbs and edible plants (natural biological feed additive) as tonics, restorative, antibacterial and antiparaitic drugs for improving the productive performance in poultry (Khodary *et al.*, 1996 and Dicknes *et al.*, 2000).

Many compounds are responsible for plant flavor (e.g. terpenoid capsaicin from chili; hot pepper) which has antibacterial properties (Ziauddin *et al.*, 1996, Cowan, 1999; Dicknes *et al.*, 2000 and Hojeong *et al.*, 2001).

The positive effect of hot pepper may be due to its stimulant carminative, digestion and antimicrobial properties (Jones *et al.*, 1997; El-Husseiny *et al.*, 2002). Also, capsaicin is the spicy compound of hot pepper (Chevallier, 1996) which represents and extensively investigated group of compound called capsaicinoids ranged from 0.2 to 1% and constitute more than 1% in various pepper varieties (Davide, 1995).

Numerous investigators (Vogt *et al.*, 1989; Abdel-Malak *et al.*, 1995; Khodary *et al.*, 1996; Ibrahim *et al.*, 1998 and Al-Harthi, 2002 b) reported that

feeding hot or black pepper containing diets, improved growth performance and feed utilization of broiler chicks, as compared to the control diet. In this concern, these may be extend the use of medicinal plants as therapeutic agents may be promising (Heejeoug *et al.*, 2001).

Also, Haung *et al.* (1992) and Gill (1999) concluded that the Chinese medicinal herbs have a stimulating effect on growth of broilers. Moreover, Mc Elroy *et al.* (1994) showed that continual dietary capsaicin administration increased resistance to *Salmonella enteritidis* colonization and organ invasion throughout the normal growth period without detrimental effects on growth of the broiler chickens. While, Damme (1999) reported that spices could replace the digestion-promoting effect of the antibiotics.

Cinnamon (*cinnamomum zeylanicum)* bark has been shown to posseas anti- fungal activity and inhibition of gram- positive and gram – negative bacteria which are born in poultry food, due to its cinnamic aldelyde content. Mantovani *et al.* (1989) showed that cinnamaldehyde represents approximately 55-70% of cinnamon oil. Moreover, it contains also eugenol and several other volatile constituents including phellandrene. Cinnamon bark has allergy effect in celery- sensitive patients (Stager *et al.*, 1991). In this connection, Mukherjee and Nandi (1994) and Smith *et al.* (1998) reported that cinnamon have a potential effect as feed preservation agents.

The purpose of the present study was conducted to throw more light on the effects of different types of spices as natural feed additives on performance, carcass traits and some blood parameters of growing turkey poults.

MATERIALS AND METHODS

The presents experiment was carried out at the Animal Production Department, National Research Centre, Cairo. A total number of 168 unsexed eight weeks old Broad Breasted Bronze (BBB) turkey poults were randomly distributed into 7 treatment groups with 3 replicates of 8 birds each.

Birds were housed on floor under similar managerial and hygienic conditions, and were randomly distributed with keeping approximately equal live body weight. Feed and water were provided ad-libitum.

The basal control diet (Table 1) contained adequate levels of nutrients for growing turkey poults as recommended by NRC. (1994). Seven dietary treatments were obtained by adding the tested herbal feed additives to the control diet, being hot pepper (Hp), black pepper (Bp) and cannmon (can). Each one was added to the control diet at levels of 2 or 4 kg/ton.

Body weight and feed intake were recorded for birds at 8, 14, 20 and 26 weeks of age. At the end of the experiment, 6 birds from each treatment (3 males and 3 females) were randomly taken and deprived from feed for 12 hours, then weighed and slaughtered to estimate some carcass characteristics.

During slaughtering, blood samples were colleted from the wing vien in heparinized tubes and cintrifuged (3000 rpm/ 15 minutes). The plasma was obtained immediately and stored at -20°C tell analysis.

Table (1): Composition and calculated analysis of the basal diet.

Ingredients			%
Yellow corn			60.3
Soybean meal (44%)			21.0
Protein concentrate (52%)*			10.0
Wheat bran			7.1
Limestone			1.0
Bone meal			0.1
NaCl			0.3
DL-Methionine			0.1
Coccidiostat			0.1
Total			100
Calculated analysis			
Crude protein	%		20.86
ME		(KCal /Kg)	2800
Lysine	%		1.26
Methionine		%	0.50
Calcium		%	1.00
Available – P.	%		0.44

* **Protein concentrate contains: 52% crude protein, 1.57 crude fiber, 6.17% ether extract, 7% calcium, 3.5% available-P, 1.52% Methionine, 2.11% Meth + Cystine, 2.98% Lysine and 2416Kcal/ kg ME. Also, each 1 kg broiler concentrate contains: 12000 IU vit. A acetate; 21000IU Vit-D3; 100mg vit.E acetate; 21mg vit. K3; 10mg vit-B1; 40mg vit. B2; 15mg vit. B6; 100 µg vit. B12; 100mg pantothenic acid; 200mg nicotinic acid; 10 mg folic acid; 500 µg Biotin; 500 mg choline; 50 mg copper; 5 mg iodine; 300mg iron; 600 mg Manganese; 450mg zinc, 1 mg selenium, 1250 mg antioxidant and 2500 mg coccidiostats.**

Plasma total protein (TP), albumin (ALB), cholesterol (Cho), total lipids (TL) and alkaline phosphate (ALK) were determined using commercial kits purchased from Bio-Merieux (Morcyl Etiols charbon Minerals Rains/ France).

The economic efficiency for meat production was calculated based on the prices of the tested NFA sources and feed ingredients prevalling 2001.

The proximate analysis of the diet was conducted according to the official methods of A.O.A.C. (1990) Data obtained were analyzed using one-way analysis of variance (SAS, 1998) and Duncan's Multiple Range test were performed to detect significant differences among means (Duncan, 1995).

RESULTS AND DISCUSSION

Productive Performance :

A- Live body weight and body weight gain :

Results in Table (2) showed that inclusion of hot pepper and canella (Hp and Can) in turkey poults diets significantly improved live body weight and body weight gain during the interval periods compared with experimental group fed the unsupplemented control diet.

Moreover, black pepper showed significantly lower body weight and gain than the aforementioned groups.

Table (2): Influence of different levels of natural feed additives on growth performance traits of turkey poults ($\bar{X} \pm S.E.$).

Item	T_1 Control	T_2 0.2% hot pepper	T_3 0.4% hot pepper	T_4 0.2% black pepper	T_5 0.4% black pepper	T6 0.2% canella	T7 0.4% canella
live body weight :							
8 weeks (kg)	1.652 ± 0.179	1.668 ± 0.198	1.660 ±0.162	1.738 ± 0.205	1.755 ± 0.229	1.750 ±0.197	1.709±0.068
14 weeks (kg)	2.875^{c} ± 0.252	3.143^{ab} ± 0.315	3.182^{a} ± 0.286	2.977^{c} ±0.311	2.927^{c} ± 0.282	3.078^{b} ±0.319	2.918^{c} ±0.258
20 weeks (kg)	4.065^{bc} ± 0.380	4.327^{a} ± 0.450	4.412^{a} ± 0.450	3.992^{cd} ± 0.347	3.923^{d} ±0.335	4.183^{b} ±0.409	4.113^{b} ±0.356
26 weeks (kg)	5.028^{cd} ± 0.418	5.355^{a} ±0.459	5.427^{a} ±0.470	4.928^{d} ±0.392	4.958^{d} ±0.398	5.290^{ab}± 0.408	5.167^{bc} ±0.377
Body weight gain :							
8-14 weeks (kg)	1.223^{bc} ± 0.081	1.475^{a} ± 0.120	1.522^{a} ± 0.133	1.238^{bc} ± 0.112	1.172^{c} ± 0.055	1.328^{b} ± 0.126	1.177^{c} ± 0.082
15-20 weeks (kg)	1.190^{a} ± 0.137	1.183^{a} ± 0.125	1.230^{a} ± 0.172	1.015^{b} ± 0.064	0.997^{b} ± 0.071	1.105^{ab} ±0.094	1.195^{a} ±0.103
21-26 weeks (kg)	0.963^{b} ±0.060	1.015^{ab} ±0.029	1.015^{ab}± 0.049	0.937^{b} ± 0.053	1.035^{ab} ±0.079	1.107^{a} ±0.019	1.053^{ab} ± 0.042
8–26 weeks (kg)	3.377^{d} ± 0.247	3.687^{ab} ±0.263	3.767^{a} ± 0.309	3.190^{e} ± 0.195	3.203^{e} ± 0.174	3.540^{bc} ± 0.214	3.425^{Cd} ± 0.199
Feed intake :							
8-14 weeks (kg)	3.550^{b} ± 0.338	4.033^{a} ±0.447	4.040^{a} ± 0.331	3.555^{b} ± 0.310	3.545^{b} ± 0.245	3.891^{a} ±0.355	3.575^{b} ±0.273
15-20 weeks (kg)	4.058^{bc} ± 0.297	4.325^{ab} ± 0.385	4.404^{a} ± 0.475	3.933^{c} ± 0.234	3.897^{c} ± 0.227	4.101^{abc} ±0.336	4.410^{a} ± 0.284
21-26 weeks (kg)	4.362^{b} ± 0.229	4.834^{ab} ± 0.215	4.816^{ab}± 0.283	4.482^{ab} ± 0.267	4.921^{ab} ± 0.324	5.019^{a} ± 0.201	4.786^{ab} ±0.237
8–26 weeks (kg)	11.990^{c} ± 0.813	13.192^{a} ±1.012	13.260^{a}± 0.948	11.970^{c} ±0.747	12.363^{bc} ±0.725	13.011^{a} ±0.852	12.771^{ab}±0.784
Feed conversion (Feed/gain)							
8-14 weeks	2.877^{ab} ±0.09	2.701^{bc} ± 0.08	2.668^{c} ± 0.09	2.878^{ab} ± 0.06	3.010^{a} ± 0.07	2.935^{a} ± 0.02	3.035^{a} ±0.03
15-20 weeks	3.574^{b} ±0.14	3.689^{ab} ± 0.07	3.673^{ab} ± 0.15	3.896^{ab} ± 0.14	3.929^{a} ± 0.09	3.722^{ab} ±0.09	3.726^{b} ±0.09
21-26 weeks	4.603 ± 0.26	4.696 ± 0.13	4.736 ± 0.09	4.789 ± 0.12	4.775 ± 0.09	4.543 ± 0.209	4.551 ± 0.18
8 – 26 weeks	3.536^{d} ±0.06	3.572^{cd} ± 0.03	3.540^{d} ± 0.08	3.753^{ab} ±0.06	3.855^{a} ± 0.03	3.671^{bcd} ± 0.05	3.665^{abc} ±0.03

a, b, c, d Means within the same row have different letters are significantly different ($P<0.05$).

This improvement of these natural additives may be attributed to the biological function of these additives which shown to posses antiseptic, stimulant and digestive impacts of capsaicin, the spicy component of hot pepper as reported by Chevallier (1996). In addition, Canella was mentioned to contain the cinnamaldehyde active material which represents 55-70% of cinnmon oil and contains eugenol and other volatile constituents including phellandrene which have a potential effect as feed preservation agents (Mantovani *et al.*, 1989; Mukherjee and Nandi, 1994; and Smith *et al.*, 1998).

B- Feed intake and feed conversion ratio :

Results in Table (2) indicated that inclusion of hot or black pepper and canella as a natural feed additives in turkey diets did affect feed intake or feed conversion ratio during the different experimental periods. Concerning feed intake, results showed that feed intake followed the same trend observed with live body weight and gain, which was significantly improved for the groups fed diets supplemented with hot pepper and canella as compared to the control group. Whereas, feed intake within groups was the lowest for black pepper fed groups compared to the control group.

However, there were significant effects of different natural feed additives. Diets supplemented with hot pepper (0.2 or 0.4%) showed the best feed conversion ratio which was similar to control. While, the poorest feed conversion ratio was recorded for birds fed on 0.4% black pepper containing diet.

These results are in good agreement with those reported by Vogt *et al.* (1989) who found that cayenne (hot) pepper, coriander, white pepper did not influence gain but hot pepper at 100 mg/ kg diet improved feed conversion ratio. Also, El-Husseiny *et al.* (2002) observed that broilers fed hot pepper had significantly better feed, protein and energy conversion than the control.

In this respect, Abd El-Latif *et al.*(2002) found that addition of thyme, black cumin and Danthus to the control diet improved growth performance. These results are in good agreement with the conclusion of Portsmouth (2001) who reported that plant extracts would be considered as material growth enhances in animal feeds for their antioxidant and antimicrobial activities.

Carcass characteristics :

The data of Table (3) showed that carcass traits and internal organs were affected by dietary supplements with exception of the giblets percentage which tended to be insignificantly affected. Also, dressing percentage of group fed 0.4% hot pepper supplemented-diet was significantly higher than other groups, followed by 0.2% hot pepper and 0.2% canella groups which were not significantly different from the rest of treatment groups including also the control group.

Also, liver percentage was significantly affected, although the fluctuating values observed among supplemented groups compared to the control. Concerning the percentage of heart and gizzard, the result showed a significant increase, with few exception, for groups provided with herbal feed additives than the control one.

Table (3): Influence of different levels of natural feed additives on some carcass characteristics of turkey poults.

Item	T_1 Control	T_2 0.2% hot pepper	T_3 0.4% hot pepper	T_4 0.2% black pepper	T_5 0.4% black pepper	T6 0.2% canella	T7 0.4% canella
Livebody weight (g)	5018 ±272 3	5103 ±345.9	5056 ±343.8	5191±1356 4	4878±285.9	4971±354 2	4915±360.5
Derssing (%)	68.38^{b} ± 0.50	68.66^{ab} ±0.50	69.93^{a} + ±0.55	66.53^{c} ± 0.40	66.74^{c} ±0.22	68.47^{b} ±0.58	66.01^{c} ± 0.46
Giblete (%)	3.61 + 0.05	3.53 ± 0.06	3.77 ± 0.13	3.72 ± 0.13	3.83 ± 0.11	3.78 ±0.13	3.72 ± 0.10
Liver (%)	1.64^{ab} ± 0.05	1.50^{b} ± 0.01	1.52^{ab} ± 0.02	1.52^{ab} ± 0.03	1.65^{a} ± 0.06	1.65^{ab} ± 0.07	1.56^{ab} ± 0.04
Heart (%)	0.30^{b} ± 0.01	0.37^{a} ± 0.01	0.36^{a} ± 0.01	0.36^{a} ± 0.02	0.37^{a} ± 0.01	0.36^{a} ±0.01	0.39^{a} ±0.02
Gizzard (%)	1.67^{b} ± 0.03	1.66^{b} ± 0.05	1.89^{a} ± 0.11	1.84^{ab} ± 0 09	1.82^{ab} ± 0.06	1.77^{ab} ± 0.05	1.77^{ab} ± 0.07
Enedible parts (%)	28.01^{bc} ± 0.53	27.81^{cd} ± 0.46	26.30^{d} ± 0 58	29.74^{a} ± 0.50	29.42^{ab} ± 0.31	27.75^{cd} ± 0.67	30.28^{a} ± 0.42

a , b , c, d Means within the same row have different letters are significantly different (P<0.05).

Table (4): Some blood parameters of turkey poults fed different levels of natural feed additives.

Item	T_1 Control	T_2 0.2% hot pepper	T_3 0.4% hot pepper	T_4 0.2% black pepper	T_5 0.4% black pepper	T6 0.2% canella	T7 0.4% canella
Total protein (g/dL)	4.64 ± 0.040	4.64 ±0.047	4.71 ± 0.055	4.62 ±0.020	4.64 ± 0.040	4.61 ± 0.021	4.60 ± 0.018
Albumin (g/dL)	2 0 ± 0.02	1 93 ± 0.02	2.0 + ± 0 02	1 93 ± 0.02	2.01 ±0.01	2.0 ±0.03	1.99 ± 0.02
Globulin (g/dL)	2.64^{ab} ± 0 03	2.68^{ab} ± 0.03	2.71^{a} ± 0 05	2.68^{ab} ± 0.03	2.63^{ab} ± 0.03	2.60^{b} ± 0.02	2.61^{ab} ± 0.04
A/G ratio	0.76^{ab} ± 0 01	0.74^{ab} ± 0.01	0.74^{ab} ± 0 01	0.73^{b} ± 0.01	0.76^{ab} ± 0.05	0.77^{a} ± 0.01	0.76^{ab} ± 0.02
Total lipids (g/dL)	372.33 ± 3 929	371.67 ± 5.487	371.67 ± 4 409	371.33 ± 2.028	371.67 ± 1.764	367.00±1.528	375.00 ± 2.887
Total cholesterol (g/dL)	124.00^{a} ± 0.577	122.67^{ab} ± 1.453	122.67^{ab} ± 0 88.'	119.00^{c} ± 0.577	121.00^{bc} ± 0.577	120.00^{bc}±1.155	120.00^{bc}± 0.577
Alkaline phosphatase (g/dL)	72.57 ± 0.498	72.22 ± 0.067	72.27 ± 0.058	72.18 ± 0.379	72.29 ± 0.145	72.12 ± 0.333	72.08 ± 0.379

a , b , c, : Means within the same row have different letters are significantly difference (P<0.05).

In this respect, Azouz (2001), Zeinab *et al.* (2003), and El-Ghamry *et al.* (2004) found that carcass traits improved due to hot pepper when fed to broiler chicks, while ducks fed 0.5% and 1% hot pepper diets had significantly higher giblets and dressing percentages than the controls.

Also, Abd El Latif *et al.* (2002) found that the highest values of dressing and proportions of edible giblets were noticed when birds were fed either dietary thyme or fennel as compared with control and other treatments.

Blood parameters :

As shown from Table (4), no significant differences were noted for plasma total protein and albumin, however, that there was a slight increase in plasma total protein by feeding diet supplemented with hot pepper (0.4%). Except hot pepper (0.4%) and canella (0.2%), the results of plasma globulin showed no significant differences. Similar results were obtained by Azouz (2001) and Zeinab *et al.* (2003)

Also, the highest A/G ratio was obtained for groups fed black pepper (0.4%), canella supplements and control compared to the others.

Plasma total lipids were insignificantly lower for canella group (0.2%) compared to the other groups. Also, plasma cholesterol was significantly decreased for groups fed the tested additives as compared to the control group. This indicating the prolonged effect of tested additives on plasma cholesterol and the effect of hot or black pepper (spicy) on total lipids (Al-Harthi, 2004).

These results are similar to the previous finding of Saito *et al.* (1999) who suggested that a single high dose of capsaicin may inhibit the absorption of lipid from the gastrointestinal tract. Also, Yoshioka *et al.* (1995) showed that capsaicin enhanced energy metabolism by enhancing the catcholamine secretion of adrenal medulla, mainly through activation of the central nervous system.

No significant difference in alkaline phosphatase was observed between control group and those fed tested additives which have no deleterious effects on liver functions as shown by alkaline phosphatase. Similar results were reported by Azouz (2001), Zeinab *et al.* (2003), El-Ghamry *et al.* (2004) and Al-Harthi (2004).

In general, addition of hot or black pepper and canella to turkey poults diet had no adverse effects on blood components, as well as had no deleterious effects on liver function.

Economic efficiency :

The economic efficiency of dietary treatments are shown in Table (5). The price of natural feed additives supplememted diets were higher than control diet. Concerning the tested treatments, the group fed 0.2% or 0.4% hot pepper recorded the best value followed by 0.2% canella supplemented diets. While, the group fed 0.4% black pepper showed the worst value which recorded 113% relative to control diet.

In conclusion, using dietary herbal additives i.e. hot pepper and canella as natural growth promoters in growing turkey poult diets at levels of 0.2 or 0.4% may enhance growth performance and economic efficiency.

Table (5) : The economic efficiency of turkey poults diets containing different levels of some natural feed additives.

Items	T_1 Control	T_2 0.2% hot pepper	T_3 0.4% hot pepper	T_4 0.2% black pepper	T_5 0.4% black pepper	T6 0.2% canella	T7 0.4% canella
Cost of 1 kg of NFA (L.E./ kg)	-	8.00	8.00	16.00	16.00	14.00	14.00
Cost of basal diet (L.E./ kg)	1.673	1.673	1.673	1.673	1.673	1.673	1.673
Total price (L.E./kg)	1.673	1.689	1.705	1.705	1.737	1.701	1.729
Feed/ 1kg gain (kg)	3.536	3.572	3.540	3.753	3.855	3.671	3.665
Feed cost of 1kg gain (L.E)	5.916	6.033	6.035	6.398	6.696	6.244	6.337
Relative to control (%)	100	102	102	108	113	105	107

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استجابة الرومى النامى لأنواع ومستويات مختلفة من الاضافات الغذائية الطبيعية

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أجريت هذه الدراسة بهدف تقييم استجابة الرومى النامى لأنواع ومستويات مختلفة من الاضافات الغذائية الطبيعية مثل الفلفل الحار والفلفل الأسود والقرفة بمعدل ٠,٢ أو ٠,٤% أخذا فى الإعتبار كفاءة النمو وصفات الذبيحة وبعض مقاييس الدم والكفاءة الاقتصادية.

استخدم فى هذه الدراسة عدد ١٦٨ كتكوت رومى برونز عريض الصدر عمر ٨ أسابيع قسمت إلى ٧ معاملات، اشتملت كل معاملة على ٢٤ كتكوت (٣ مكررات – ٨ كتكوت / مكرر)؛ كانت المعاملة الأولى هى مجموعة المقارنة أما المعاملات الستة الأخرى (٢، ٣، ٤، ٥، ٦) فكانت للاضافات الغذائية الطبيعية الثلاثة كل عند مستوى ٠,٢% أو ٠,٤% واستمرت التجربة حتى عمر ٢٦ أسبوع.

أوضحت النتائج مايلى :

- أدى استخدام الإضافات الطبيعية مثل الفلفل الحار أو القرفة لعليقة المقارنة إلى تحسن معنوى فى وزن الجسم والزيادة فى الوزن وكمية المأكول بينما لم يتأثر معامل التحويل الغذائى للمجاميع المغذاه على علائق تحتوى على الفلفل الحار مقارنة بمجموعة المقارنة فى حين انخفضت كفاءة التحويل الغذائى للمجاميع المغذاة على العلائق المحتوية على الفلفل الأسود أوالقرفة.
- كانت هناك زيادة معنوية فى نسبة التصافى للذبيحة بالنسبة للمجاميع المغذاة على الفلفل الحار. كما أظهرت النتائج زيادة معنوية فى نسبة القلب والقونصة للمجاميع المغذاة على الإضافات المستخدمة بصفة عامة مقارنة بمجموعة الكنترول .
- ارتفع محتوى بلازما الدم من البروتين الكلى والالبيومين والجلوبيولين للمجموعة المغذاة على الفلفل الحار (٠,٤%) بينما لوحظ نقص غير معنوى فى الليبيدات الكلية للمجاميع التجريبية و لم يكن هناك تأثير عكس على الجليسريدات الثلاثية.

من هذه الدراسة تشير النتائج إلى إمكانية استخدام الفلفل الحار أو القرفة عند مستوى ٠,٢ أو ٠,٤% لتحسين الأداء الإنتاجى دون حدوث تأثيرات عكسية على مقاييس الدم للرومى النامى.