

# THE GRAPE POMACE INFLUENCE ON THE BROILER CHICKENS GROWING RATE

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## Abstract

The grape pomace, by-product generated during the winemaking process can be used in the farm animals nutrition due to its important contain in proteins, carbohydrates, fats, minerals and polyphenolic compounds with antioxidant properties. The aim of the present study was to assess the grape pomace influence on the chickens growing rate (hybrid COBB 500, starting with their first day of life and up to the 40th day). A total of 142 unsexed chicks (housed in 12 pens) were organized in three groups: one control LC (without grape pomace in feed) and two experimental, respectively LT1 (with 1% grape pomace) and LT2 (with 2% grape pomace). Results showed a higher growing rate in LT2 chickens starting with their week of life and during the entire period of analysis, the average gain at the 40 days of age being higher at the LT1, and LT2 than the control's one with 32.2g (1.2%) and 73.8g (2.74%) respectively. The broiler chickens which were feed with added grape pomace performed a better feed conversion for the entire growing period (FCR at 40 days of age were 1.73% and 2.66% lower for LT2 and LT1).

Considering the above presented facts, we recommend to use the grape pomace to feed the broiler chickens, a 2% grape pomace added to mixed foddors gives an advantage of growing rate and feed consumption.

**Key words:** grape pomace, growing rate, broiler chickens, polyphenolic

## INTRODUCTION

The grape pomace resulted from the grapes vinification process is a very important source of proteins, carbohydrates, fats, mineral substances and polyphenols compounds [1, 5].

The polyphenols have a series of beneficial properties, the antioxidant effect is one of the most important. The antioxidant compounds present in grapes have already been identified as phenolic acids, derivatives of stilbene, flavan-3-ols (catechin and epicatechin), flavonols, anthocyanidins [3]. These compounds can assure for the animal organism protection against the oxidative reaction and free radicals, being able to prevent some of the degenerative diseases [6].

Thanks to the large quantities available and bioactive compounds contained, the grape pomace can be used in the animal nutrition, but first it is necessary to know the influence on the productive performances

In order to determine the effect of the grape pomace in the broiler chickens feed on

the growing performances, this study had as objective following the evolution of body weight, the weight gain, viability, consumption and feed conversion for the entire growing period. At the end of the experiment the European Efficiency Factor (EEF) was calculated.

## MATERIALS ȘI METHODS

Fresh grape pomace resulted from the vinification process of the red grapes (variety Fetească neagră) was obtained at the Research Station (V. Adamachi farm) of U.A.S.M.V. Iași and was submitted to a natural drying process, in a clean and well ventilated space, at a constant temperature of 20°C.

The determination of the crude chemical content from the grape pomace was made by using standardized methods [8, 9, 10, 11, 12, 13], the polyphenols and tannins were determined by using the Folin Ciocalteu method [7].

The proximate chemical content of the grape pomace concerning the crude protein, crude fat, crude cellulose, crude ash and the content in polyphenolic compounds are presented in the table 1.

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Table 1 Proximate composition of grape pomace (% of DM)

Specification (%)	% of DM
Dry Matter	94.06
Crude Ash	5.53
Organic Matter	94.22
Crude Protein	13.55
Crude fat	9.24
Crude Fibre	30.27
Total Polyphenols	4.00
Tannins	3.33
Non-nitrogenous Extractive Substances	41.05

The research has been carried out within the Experimental farm of the Animal Science Faculty, part of „Ion Ionescu de la Brad” Iasi University of Agricultural Sciences and Veterinary Medicine, using a flock of 142 one-day-old as-hatched broiler chickens, from the

meat hybrid Cobb 500. The flock was divided in three groups, namely one control group LC (without grape pomace in feed) and two experimental groups, respectively LT1 (with 1% grape pomace) and LT2 (with 2% grape pomace). The LC group was formed of 70 chicks and the experimental groups that consisted of 36 chicks each. The chicks were assigned in 12 pens.

The feed was conceived in order to satisfy the requirements of the broiler chickens in all the stages of growth, as recommended by the management manual of the studied hybrid (COBB 500). There were elaborated three distinct diets of mixed fodders, which were specific for each period of growth of the studied chickens, namely: starter, grower and finisher feeds (tab. 2).

Table 2 Ingredients and nutrient composition of experimental diets (percent of diets)

Ingredient	Starter diet (0-10 d)	Grower diet (11-26 d)	Finisher diet (27-40 d)
Corn	38.28	36.20	41.60
DDGS	7.50	-	-
Wheat	12.00	20.00	20.00
Soybean meal	29.30	33.65	28.50
Full fat soybean	7.00	-	-
Vegetable oil	1.00	6.25	6.23
DL-Methionine	0.40	0.33	0.28
L-Lysine	0.40	0.17	0.14
L-Threonine	0.10	0.04	0.05
Calcium carbonate	1.80	1.15	1.10
Monocalcium phosphate	1.32	1.22	1.14
Salt	0.33	0.36	0.33
Premix	0.50	0.50	0.50
Salinomax	-	0.06	0.06
Avatec	0.07	0.07	0.07
TOTAL	100	100	100
Analyzed composition			
Metabolisable Energy (Kcal/kg)	2928	3121	3180
Crude protein (%)	23.16	21.3	19.33
Methionine +Cystine (%)	1.114	0.973	0.879
Lysine (%)	1.439	1.171	1.030
Crude fiber (%)	3.462	2.862	2.722
Calcium (%)	1.104	0.81	0.759
Available phosphorus (t) %	0.60	0.58	0.548
Crude fat (%)	5.216	8.462	8.73
Protein-energy ratio	126.4	146.5	164.5

Both the feed and the water were administrated “ad libitum” to all three groups. The chicks received a lighting program of 23 hours light / 1 hour darkness. Milled grape pomace was introduced in chickens feed from the experimental groups (particles < 2 mm diameter), since the first day of their life until the slaughter (at 40 days).

The assessment of growing rate was made weekly, by individual weighting, of the entire flock. The average body weight was appreciated following the broiler chickens weighting, for each group, and the weight gain of the chicks was determined by the difference between average body weight and previous average weight.

Also there were obtained results concerning the weekly feed intake for estimate the total feed intake and the feed conversion rate (kg fodder/kg gain).

At the end of the experimental period (40 days) the European Efficiency Factor (EEF) was calculated, based on the age of broilers at sacrifices (days), their average live weight (kg / head), viability (%) and feed conversion rate - FCR (kg fodder / kg gain).

The results obtained were statistically processed using the Anova uni-factorial test ( $p < 0.05$ ) in order to highlight the significant differences between all groups, Fisher test (test for two samples variances) and t-student

test to compare the significant differences between two groups.

## RESULTS AND DISCUSSION

The results regarding the body weight of broilers are presented in the table 3.

The differences between the experimental groups and the control group have advanced notably in favor of the T2 group, at the last weighting the average body weight was higher with 32.2 g (1.2%) for LT1 group and with 73.8 g (2.74%) for LT2 group. Statistically, there weren't significant differences concerning the weight between the groups ( $p > 0.05$ ). The same dynamic of growing of the broiler chickens can be observed in fig. 1.

Table 3 Body weight evolution of the studied broilers

Specification	LC (control)	LT1 (grape pomace 1 %)	LT2 (grape pomace 2 %)
	The average body weight (g/bird) $\bar{X} \pm DS$		
At 0 day	43.93 ± 4.49	43.22 ± 3.35	43.39 ± 3.12
At 7 days	183.54 ± 25.78	176.17 ± 22.58	186.94 ± 19.43
At 14 days	498.87 ± 58.47	470.29 ± 62.18	497.39 ± 50.43
At 21 days	976.63 ± 107.73	971.00 ± 114.31	1004.97 ± 99.40
At 28 days	1610.72 ± 160.86	1575.76 ± 156.39	1602.12 ± 129.94
At 35 days	2235.43 ± 228.28	2257.24 ± 227.10	2277.82 ± 183.92
At 40 days	2690.84 ± 281.33	2723.06 ± 277.98	2764.61 ± 225.17

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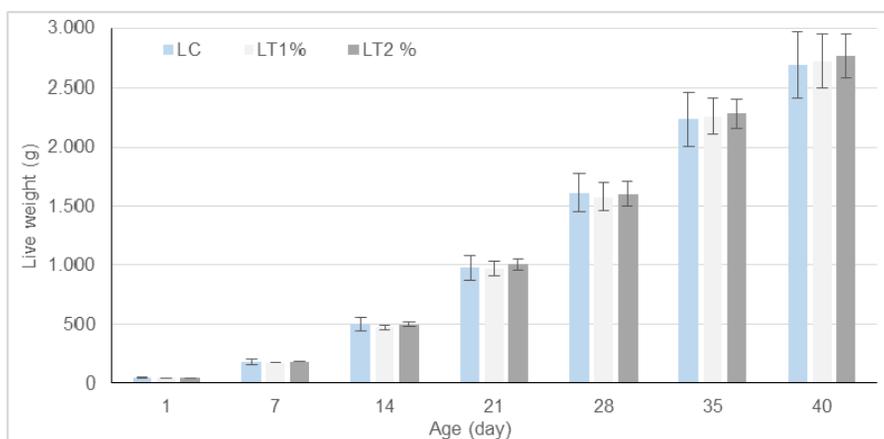


Fig. 1 Body weight dynamics of the studied broiler

During the growing period, the weekly weight gains registered by the chicks from the experience groups had variables evolutions (tab. 4). At the end of the experience (40 days), total weight gain was with 74.3 g (2.81%) at T1 group and respectively with 32.56 g (1.23%) at T2 group, higher than the control group.

Table 4 Average weekly weight gain evolution of the studied broilers

Period	LC (control)	LT1 (grape pomace 1 %)	LT2 (grape pomace 2 %)
	Average weight gain (g/bird)		
1 - 7 days	139.61	132.97	143.55
8 - 14 days	315.33	293.76	310.45
15 - 21 days	477.76	500.71	507.58
22 - 28 days	634.09	604.76	597.15
29 - 35 days	624.72	681.47	675.70
36 - 40 days	455.40	460.47	486.79

From the data presented in tab. 5, it can be observed lower weekly feed intake at the experimental groups compared to those obtained at the control group. Thus, in the first three weeks, the average consumption was lower (with differences above 1%) at the experimental groups compared to control group. These consumption differences can be also correlated with the weight gain registered in the first two weeks, being lower at the experimental group compared to the control group (LC).

In the next three weeks it has shown a higher feed intake at the experimental groups, so that at the end of the experimental period the average total feed intake was higher with 1.03% (4534.50 g) at the LT2 group and lower with 1.46% (4422.74 g) at the LT1 compared to the LC group which had a total consumption of 4488.18 g (tab. 6). These consumption differences could be justified by the fact that the chicks which received grape pomace in their mixed fodder were better adapted to feed after the third week of their life.

Table 5 Average weekly feed intake of the studied broilers

Period	Average weekly feed intake (g/bird)		
	LC (control)	LT1 (grape pomace 1 %)	LT2 (grape pomace 2 %)
1 - 7 days	247.62	219.32	238.35
8 - 14 days	426.23	355.48	359.01
15 - 21 days	795.79	761.94	785.03
22 - 28 days	961.33	1001.66	967.89
29 - 35 days	1233.88	1176.17	1180.69
36 - 40 days	823.33	908.17	1003.54

As for the feed conversion rate (tab 6., fig 2), when the chicks were 40 days-old, the experimental groups registered a feed conversion (FCR) lower with 2.66% (1.651 kg fodder/kg gain) for the LT1 group and with 1.73% (1.666 kg fodder/kg gain) for the LT2

group compared to the LC group that has achieved a FCR of 1.696 kg fodder/kg gain.

Although, the chickens from LC group had achieved a feed conversion rate higher than those from LT1- LT2 groups, this rate is not reflected in their weight gain that was registered.

Table 6 Total feed conversion rate of the studied broilers

Treatments	Total average weight gain (g)	Total average feed intake (g)	Total FCR (kg fodder/kg gain)	± % compared to LC
LC	2646.91	4488.18	1.696	100
LT1	2679.47	4422.74	1.651	-2.66
LT2	2721.21	4534.50	1.666	-1.73

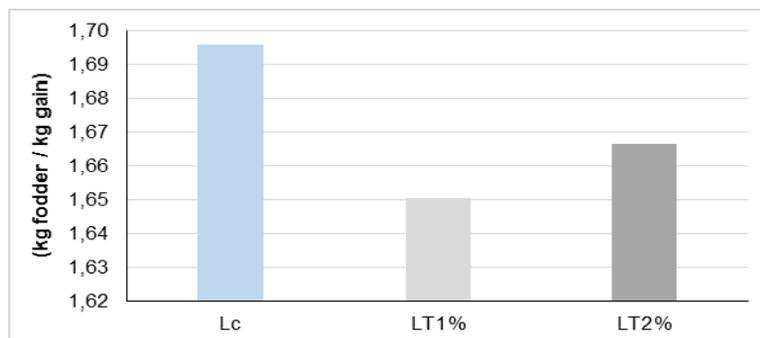


Fig. 2 Total feed conversion rate

From those presented above, regarding the feed conversion rate, it results that the broiler chickens which has received grape pomace in their mixed fodder has achieved a better feed conversion, the values obtained being more reduced compared to the control group (- 1.73% and - 2.66%).

Throughout the experience, it were registered some losses from the flock, which were recorded in the normal range (2-4%) for the hybrid used in the experiment. The most losses were registered in the first and the second week of life of the chicks, at the LC control (3 losses), due to the accidents.

Concerning the European efficiency factor (EEF), the best values were recorded by the chickens that have received grape pomace in their feed; the values calculated are presented in the table 7.

There are few references in the published literature regarding the use of grape pomace in the broiler chickens feed. The addition of grape pomace in the broiler chicks feed in proportion of 0.5; 1.5; 3 and 6 % has not affected the growth performance, the digestibility of proteins and amino acids [2, 4]. The results of these studies had highlighted an increase of the antioxidant activity in the feed, excretion and meat. The chickens that received a proportion of 3% grape pomace in their feed recorded a higher weight gain with 17 g (2.59%) and a lower feed conversion rate with 1.53% compared to the reference group, at the age of 21 days [2].

The grape pomace concentrated may be a new source of antioxidants for the animal nutrition, such as vitamin E [2].

Table 7 European Efficiency Factor (EEF)

Lot	Age (days)	Average body weight (Kg)	Viability (%)	FCR. (Kg fodder /kg gain)	EEF	
					Absolute	Relative
LC	40	2.691	95.71	1.696	380	100
LT1	40	2.723	97.22	1.651	401	105.59
LT2	40	2.765	97.22	1.666	403	106.20

## CONCLUSIONS

The average body weight of the chickens from the three experimental groups was practically equal at the beginning of the experiment, but over the course it has been differentiated, so that finally has increased to the chickens from the T1 and T2 group, that used grape pomace in their diet. The experimental groups recorded superior

average body weights than the control group with 1.2 – 2.74%, the best weight was recorded by the LT2 experimental group which received a proportion of 2% grape pomace in their feed, without registering significant statistical differences.

In concordance with the growing rate was established the weekly average weight gain, this one presenting a variable evolution

throughout the experimental period. The 5th week of life was the period that was highlighted the greatest weight gains, being recorded a higher weekly average weight gain with 8.16 % (675.70 g- T2 group) respectively 9.08% (681.47 g- T1 group) compared to the control group (624.72 g).

The average consumption of feed/bird throughout the experimental period was higher with 1.03% at LT2 and lower with 1.46 % at LT1 than the control group (LC), the feed conversion rate being also in closely concordance with the corporal weight evolution and it was influenced by the performances of the experimental groups but without registering significant differences. Thus, throughout the period of growth, at the experimental groups, the feed conversion rate was more reduced (1.651 at LT1 and 1.666 at LT2) than the control group (1.696).

Our researches has revealed that the addition of the grape pomace in proportion of 1 and 2% in the broiler chickens feed is beneficial, with a slight positive influence on the growth performances. The results were superior notably in the case of using grape pomace in proportion of 1%, which has obtained the lowest feed conversion rate.

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