OPEN ACCESS
Advances in Animal and Veterinary Sciences

Research Article

Effect of Different Levels of Commercial *Saccharomyces cerevisiae* with the Ration on Some Carcass Characteristics of Awassi Lambs

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Abstract | The aim of this study was to investigate the effect of adding different levels of commercial *Saccharomyces cerevisiae* (Sc) to the Awassi lambs ration on the meat and carcass characteristics. Sixteen local Awassi male lambs aged 6-6.5 months with initial weight of 36±0.34 kg were allocated and distributed into four treatments with four lambs each as follow: T1 (control), T2 (3 gm Sc/head/day), T3 (5 gm Sc/head/day), T4 (7 gm Sc/head/day). Wheat straw was provided *ad libitum* as a roughage diet while concentrate diet was provided for each treatment lambs by 2.5% of weekly live body weight for the whole study period (seventy five days). At the end of the study, lambs were weighed then slaughtered. Results shows a significant superiority (P<0.05) of the T3 compared with T2 in the hot and cold carcass weight, also a significant superiority (P<0.05) of T 3 and 4 was detected in the dressing percentage comparing with control. Results revealed that the differences among treatments in the fore and hindquarter cuts were not significant. A significant decrease (P<0.05) was detected in the kidney and pelvic fat and fat tail percentages in the treated groups. The T4 showed a significant (P<0.05) backfat thickness among treatments. The significant differences (P<0.05) were found among treatments in ribeye area. Results showed a non-significant increase of lean and significant decrease (P<0.05) (except with T2) in the fat in treated groups. T3 shows a significant increase (P<0.05) in the protein and a significant decrease (P<0.05) in the fat among treatments, while T2 and 4 showed a significant superiority (P<0.05) in each of the moisture and ash respectively among treatments. The results of the current study confirmed the positive effect of adding Sc on the hot and cold carcass weight, dressing percentage and main carcass cuts.

Keywords | *Saccharomyces cerevisiae,* Awassi lambs, Carcass characteristics, Meat traits

Editor | Kuldeep Dhama, Indian Veterinary Research Institute, Uttar Pradesh, India.
Received | July 28, 2018; **Accepted** | August 31, 2018; **Published** | September 22, 2018
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Citation | Aldoori ZT, Al-Obaidi ASA (2018). Effect of different levels of commercial *saccharomyces cerevisiae* with the ration on some carcass characteristics of awassi lambs. Adv. Anim. Vet. Sci. 6(10): 462-466.
DOI | http://dx.doi.org/10.17582/journal.aavs/2018/6.10.462.466
ISSN (Online) | 2307-8316; **ISSN (Print)** | 2309-3331

INTRODUCTION

Meat is an excellent source of protein, which is essential for any healthy diet. It helps build and repair muscle as well as help maintain healthy hair, bones, skin and blood. Due to its high biological value, protein obtained from meat is easily digested and thus absorbed quickly and effectively by the body (Milewski, 2006). Awassi sheep is considered one of the most common breeds in Iraq and some countries of the Arab world and Turkey (Al-Kass et al.,1993; Al-Samarai et al., 2015; Nasir et al., 2018) It has a great importance in Iraqi, where it provide local markets with large quantities of red meat and other products (Athab et al., 2015). Yeast feed additives such as *Saccharomyces cerevisiae* (Sc) is one of the important technique used to enhance animal production efficiency, which has increased research on their positive effects in the last years (Guedes et al., 2008; Zhang et al., 2005) especially after the prohibition of antibiotics (Cooper and Kennedy, 2007) which is the most popular feed additives due to meat products contamination with antibiotic residues, that led to the need of evaluate using of this fungi and its effects on gastrointestinal and rumen (Menten, 2001). Several researches have been recorded positive effects when use this feed additives with ruminant animals, which are beneficial modifications to microbial activities, fermentation and digestive functions of the rumen (Hassan and Saeed, 2013). Raghebian et al. (2017) illustrated that the main target of using yeast

for lamb is to increase the breakdown of dietary fiber and protein which lead to increase microbial protein as a main source of amino acids in the small intestinal. Moreover, Sc yeast has biologically valuable proteins, vitamin B-complex, important traces minerals and several unique plus factors. Denev et al. (2007) recorded several mechanisms to explain that positive effects, such as improvement and accelerate rumen maturation (McDonald, 2002), and improve rumen fermentation (Pienaar et al., 2012), in addition it may increase rumen anaerobic and cellulytic bacteria (Jouany, 2001). Jurkovich et al. (2007) mentioned that feed additives from yeasts in ruminant diets can act as a growth promoter. Also improved the rumen environment and microorganisms effectiveness (Tricarico et al., 2006; Chevaux and Mazzia-Fabre, 2007). On the other hand many other research results were shown adverse or non-positive effects of this additives (Bayat et al., 2015; Obeidat, 2017; Raghebian et al., 2017), for that reason, and because of insufficient research that study the effect of that kind of feed additives on Awassi lamb carcass and meat, the aim of this research was to investigate the effect of adding different levels of commercial *Saccharomyces cerevisiae* as feed additives on carcass characteristics of Awassi lamb.

MATERIALS AND METHODS

sixteen local Awassi male lambs aged 6-6.5 months with initial weight of 36±0.34 kg were allocated and divided randomly into four treatments with four lambs each as following: treatment one T1 (control treatment), treatment two T2 (3 gm Sc/head/day), treatment three T3 (5 gm Sc/head/day), treatment four T4 (7 gm Sc/head/day).The lambs were distributed in the individual cages of 1.75×1.25m, each cage contain two portable plastic feeders for each concentrate and roughage feed, besides portable water pail and mineral salts block. Each lamb was subjected to introductory period for two weeks before the start of study so as to accustom the lambs to the cages and feed providing style. Routine veterinary treatment schedule was followed in this period for all of the lambs.

Wheat straw was provided *ad libitum* as a roughage diet for each treatment lambs for the whole study period while concentrate diet (Table 1) was provided for each treatment lambs by 2.5% of weekly live body weight for the whole study period also which was seventy five days. At the end of study period, weight of each lamb was taken by small ruminant electronic scale, and that was considered as slaughter weight. Afterwards, the other measurements such as hot carcass weight, empty body weight and offal's fat weight were taken after the slaughter. Carcasses were covered withcloth and hanged in chilling room (4 degree centigrade for 24 hours) and cold carcass weights were taken. Each kidney and pelvic fat, tail fat and neck weights were recorded before cutting the carcasses lengthwise into two equal halves right and left (Forrest et al., 1975).The weights of each fore quarter and hind quarter cuts were recorded as well as rib eye area and back fat thickness. Leg physical dissection was done (Jones et al., 1983) and weights of components were recorded. Also whole leg meat chemical composition analysis has been done.

Statistical analysis was conducted to investigate treatments effect on different measurements by statistical analysis program (SAS, 2004) with completely randomized design. The differences between the means were compared by Duncan test (Duncan, 1955).

Table 1: Formula and chemical composition of concentrate diet

Ingredients	**%**
Barley grain	49
Yellow corn	39
Soybean meal	10
salt	1
Min. and vit. mixture	1
Chemical composition / kg dry matter	
Dry matter	94
Organic matter	91
Total nitrogen	21.3
Crude fibers	50.8
Ether extract	34
Nitrogen free extract	700
Metabolisable energy MJ/Kg	12.7

RESULTS AND DISCUSSION

Table 2 shows the effect of different treatments on different weights and dressing percentage. We can notice significant superiority (P<0.05) of treatment 3 (5gm Sc/head/day) comparing with treatment 2 (3gm Sc/head/day) in each of the hot and cold carcass weight, also a significant superiority (P<0.05) of treatments 3 and 4 was shown in dressing percentage comparing with control treatment.

Tables 3 and 4 showed the effect of different treatments on the right carcass half fore quarter and hind quarter cuts. As we can see there are no significant differences among treatments in each of the fore and hind quarter cuts, in spite of non-significant superiority of treatment 3 and 4 in most main cuts percentage like shoulder, breast and leg comparing with control treatment.

Table 5 shows the effect of different treatments on carcass and offal's fat percentage, back fat thickness and rib eye area. We can observe significant decrease in adding treatments comparing with control in each kidney and pelvic

Table 2: Effect of different treatments on different weights and dressing percentage (mean±std error)

Treatments	Parameters				
	Slaughtering weight (kg)	Empty body weight (kg)	Hot carcass weight (kg)	Cold carcass weight (kg)	Dressing percentage* (%)
T1 Control	48.75±1.64	42.46±1.87	23.89±0.91 ab	23.44±0.9 ab	55.26±0.95 b
T2 3gm Sc/head/day	46.13±2.20	39.83±1.96	23.32±0.69 b	22.76±0.65 b	57.34±1.31 ab
T3 5gm Sc/head/day	48.75±2.39	42.79±2.06	26.22±0.91 a	25.59±0.89 a	59.93±0.93 a
T4 7gm Sc/head/day	46.75±1.39	40.45±1.42	24.23±0.69 ab	23.69±0.65 ab	58.61±0.61 a

* based on empty body weight. - Different letters within column refer to significant differences (P≤0.05) between means.

Tables 3: Effect of different treatments on the right carcass half fore quarter cuts (mean±std error)

Treatments	Parameters				
	Ribs (%)	Shoulder (%)	Breast (%)	Neck (%)	Fore shank (%)
T1 Control	4.43±0.15	6.97±0.66	4.34±0.23	6.05±0.57	4.09±0.15
T2 3gm Sc/head/day	4.28±0.47	6.96±0.35	4.83±0.57	5.77±0.48	3.81±0.24
T3 5gm Sc/head/day	3.84±0.51	7.68±0.47	5.39±0.74	5.28±0.56	4.29±0.61
T4 7gm Sc/head/day	4.02±0.20	8.59±0.56	4.33±0.17	5.35±0.63	3.69±0.22

All differences were not significant

fat and fat tail percentages. Treatment 4 records the least significant back fat thickness among treatments. Significant differences between adding treatments in rib eye area have been recorded with no different with control treatment.

Tables 4: Effect of different treatments on the right carcass half hind quarter cuts(mean±std error)

Treatments	Parameters		
	Leg (%)	Loin (%)	Flank (%)
T1 Control	11.52±1.14	6.04±0.13	1.48±0.06
T2 3gm Sc/head/day	14.08±1.34	5.74±0.63	1.5±0.13
T3 5gm Sc/head/day	13.07±0.88	5.50±0.69	1.42±0.13
T4 7gm Sc/head/day	14.23±0.59	4.82±0.21	1.39±0.06

All differences were not significant

Tables 6 and 7 showed the effect of different treatments on the leg physical dissection component and meat chemical composition. Results showed a non-significant increase of lean and significant decrease (P<0.05) (except with T2) in the fat comparing with control treatment. Treatment 3 shows a significant increase (P<0.05)in the protein and a significant decrease (P<0.05) in the fat among treatments, while treatments 2 and 4 results showed a significant superiority (P<0.05) in each of the moisture and ash as compared with other treatments.

From the results of this study we can notice that there was a positive effect of adding Sc on the hot and cold carcass weight, dressing percentage and main carcass cuts. The feed additives also decrease the carcass fat, leg fat percentage and increased the rib eye area and leg lean and protein percentage in varying proportions. These results agree with the results obtained by Milewski and Zaleska (2011) who reported that the adding of the dietary supplementation of brewer's yeast, Sc in the ration of Kamieniecka breed lamb led to a significant increase (P<0.05) in the meat protein comparing with non-treated lamb group. They were illustrated that the positive changes in chemical composition of lamb's meat may be correlated with the rate of rumen fermentation and metabolism of end products under the influence of yeast. Our results also agree with Lazim et al.(2012) who noticed that there is an improvement of most Awassi lambs carcass characteristics fed with Sc (2 kg/ton) and Iraqi probiotic (1 kg/ton). They concluded that

Table 5: Effect of different treatments on carcass and offal's fat percentage, back fat thickness and rib eye area (mean±std error)

Treatments	Parameters					
	Abdominal fat (%)	Heart fat (%)	Kidney and pelvic fat (%)	Fat tail (%)	Back fat thickness (cm)	Rib eye area (cm^2)
T1 Control	1.9±0.14	2.38±0.72	1.34±0.05 a	16.11±0.59 a	7.70±0.26 a	11.13±0.6 ab
T2 3gm Sc/head/day	2.03±0.36	2.44±0.54	0.64±0.07 b	11.84±0.74 b	7.00±0.47 a	10.58±0.83 ab
T3 5gm Sc/head/day	1.58±0.26	2.81±0.42	0.72±0.19 b	12.31±0.29 b	7.10±0.32 a	8.85±0.68 b
T4 7gm Sc/head/day	2.52±0.49	2.33±0.17	0.55±0.06 b	12.49±0.61 b	5.55±0.49 b	11.60±0.77 a

- Different letters within column refer to significant differences (P≤0.05) between means.

Table 6: Effect of different treatments on leg physical dissection component (mean±std error)

Treatments	Parameters		
	Lean (%)	Fat (%)	Bone (%)
T1 Control	58.04±2.06	15.70±2.46 a	26.27±0.67
T2 3gm Sc/head/day	58.28±0.27	14.01±0.68 ab	27.71±0.80
T3 5gm Sc/head/day	61.42±0.89	9.60±0.74 b	28.91±1.39
T4 7gm Sc/head/day	61.43±0.37	10.97±1.13 b	27.60±1.31

- Different letters within column refer to significant differences (P≤0.05) between means.

Table 7: Effect of different treatments on legmeat chemical composition (mean±std error)

Treatments	Parameters			
	Protein (%)	Fat (%)	Moisture (%)	Ash (%)
T1 Control	16.35±0.21 b	24.50±0.12 a	57.70±0.14 b	0.74±0.02 b
T2 3gm Sc/head/day	16.15±0.06 b	23.88±0.41 a	58.40±0.27 a	0.77±0.04 b
T3 5gm Sc/head/day	17.23±0.19 a	23.05±0.09 b	57.68±0.18 b	0.73±0.02 b
T4 7gm Sc/head/day	15.98±0.06 b	24.10±0.07 a	58.23±0.11 ab	0.87±0.01 a

- Different letters within column refer to significant differences (P≤0.05) between means.

this improvement is a result of increase of the amino acids and microbial protein flowing into small intestine due to the yeast additives effect (Oeztuerk et al., 2005). On the other hand, results disagree with Al-Khauzai et al. (2012), Issakowicz et al. (2013) and Raghebian et al. (2017). From all of that we can conclude that the Sc additives play a positive role in rumen by increase the breakdown of dietary fiber and protein which lead to increase microbial protein as a main source of amino acids in the small intestinal (Raghebian et al., 2017), that enhancement of available protein or amino acids led to improve carcass and meat characteristics. Decrease of carcass fat may be related with the amount of concentrate feed intake which may decrease also leading to lack in energy and fat deposit in carcass and meat.

ACKNOWLEDGEMENTS

The authors acknowledge Dr. F. R. Al-Samarai his assistance.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS CONTRIBUTION

Ahmed Sinan Al-Obaidi: Animal work, sample collection, and manuscript preparation.

Ziyad Tariq Aldoori: Designing the experiment, animal work, sample collection, manuscript preparation, statistical analysis, and publishing the article "corresponding author".

REFERENCES

- Adhab AA, Al-Jalili ZF, Taha SA (2015). Effect of different breeding systems of Awassi flocks of some reproductive traits and body measurements. Diyala Agri. Sci. J. 7(2), 49-58.
- Al-Kass JI, Al-Jalili ZF, Aziz DI (1993). The basics of sheep and goat rearing and production.Book. The National Library. Baghdad University.
- Al-Khauzai ALD, Abdel-Lattif FH, Amer JA (2012). Effect of addition Saccharomyces *Cerevisiaea* and black seed on some productive and biochemical traits of male lambs for Awassi sheeps. Al-Furat. J. Agri. Sci. 4(2):57-68.
- Al-Samarai FR, Al-Anbari NN, Al-Nedawi AM (2015). Specify the best covariance stricter for repeated measurements data with/without missing observations using mixed model. Iraqi J. Agri. Sci. 46(4): 638-643.
- Bayat AR, Kairenius P, Stefański T, Leskinen H, Comtet-Marre S, Forano E, Shingfield KJ (2015). Effect of camelina oil or live yeasts (*Saccharomyces cerevisiae*) on ruminal methane production, rumen fermentation, and milk fatty acid composition in lactating cows fed grass silage diets. J. Dairy Sci. 98(5): 3166-3181. https://doi.org/10.3168/jds.2014-7976
- Chevaux E, Mazzia-Fabre M (2007). Probiotic yeast in small ruminants. Feed Mix. 15(1), 28.
- Cooper KM, Kennedy DG (2007). Stability studies of the metabolites of nitrofuran antibiotics during storage and cooking. Food Addit. Contam. 24(9): 935-942. https://doi.org/10.1080/02652030701317301
- Denev SA, Peeva TZ, Radulova P, Stancheva N, Staycova G, Beev G, Todorova P, Tchopanova S (2007). Yeast Cultures in Ruminant Nutrition. Bulg. J. Agri. Sci. 13: 357-374.
- Duncan DD (1955). Multiple range and multiple F-test. Biometrics. 11: 1-42. https://doi.org/10.2307/3001478
- Forrest JC, Aberle ED, Hedrick HB, Judge MD, Merkel PA (1975). Principles of Meat Science. Schweigret, B.S. (Ed.),
- Guedes CM, Goncalves D, Rodrigues MAM, Dias-da-Silva A (2008). Effects of a *Saccharomyces cerevisiae* yeast on ruminal fermentation and fiber degradation of maize silages in cows. Anim. Feed Sci. Technol. 145(1): 27-40.
- Hassan SA, Saeed AA (2013). Effect of feeding different levels of dietary protein and addition of Baker's yeast (*Saccharomyces cerevisiae)* on productive parameters of Awassi lambs. J. Agri. Sci. Technol. A 3(6A): 484.
- Issakowicz J, Bueno MS, Sampaio ACK, Duarte KMR (2013). Effect of concentrate level and live yeast (*Saccharomyces cerevisiae*) supplementation on Texel lamb performance and carcass characteristics. Livest. Sci. 155(1): 44-52. https://doi.org/10.1016/j.livsci.2013.04.001
- Jones SDM, Burges TD, Dupchak K (1983). Effect of dietary energy intake and sex on carcass tissue offal growth in sheep. Can. J. Anim. Sci. 63: 303 - 413. https://doi.org/10.4141/cjas83-038
- Jouany JP (2001). 20 years of research and now more relevant than ever- the coming of age of yeast cultures in ruminant diets. In: Responding to a Changing Agricultural Landscape. Alltech's European, Middle Eastern and African Lecture Tour. 44-69.
- Jurkovich V, Kutasi J, Fébel H, Brydl E, Könyves L, Tirián A (2007). The effect of micro-capsulated yeast supplementation on rumen fermentation in sheep. In Animal health, animal welfare and biosecurity. Proceedings of the 13th International Congress in Animal Hygiene. Tartu Estonia 2 (pp. 843-845). Estonian University of Life Sciences, Jõgeva Plant Breeding Institute, Estonian Research Institute of Agriculture.
- Lazim JS, Khadom BN, Shamran SHA (2012).The Effect of Use Some Agricultural and Manufactural By Productes Supplemented With Bread Yeast *Saccharomyces cerevisiae* and Iraqi Probiotic on Some Production Characteristics of Awassi Lambs Carcasses. The Second Scientific Conference of the Faculty of Agriculture, Karbala University.
- McDonald P (2002). Animal Nutrition. Pearson education.
- Menten JFM (2001). Aditivos alternativos na nutrição de aves: probióticos e prebióticos.Reunião Anual da Sociedade Brasileira de Zootecnia. 38:141-157.
- Milewski S, Zaleska B (2011). The effect of dietary supplementation with *Saccharomyces cerevisiae* dried yeast on lambs meat quality. J. Anim. Feed Sci. 20(4): 537-545. https://doi.org/10.22358/jafs/66208/2011
- Milewski S (2006). Health-promoting properties of sheep products. Medycyna Weterynaryjna. 62(5):516-519.
- Nasir MA, Al-Anbari NN, Taha AA (2018). The effect of kind blood parasite infection on some productive traits in Turkish Awassi sheep . Iraqi J. Agri. Sci. 48(6B):1672-1676.
- Obeidat BS (2017). The effects of feeding olive cake and *Saccharomyces cerevisiae* supplementation on performance, nutrient digestibility and blood metabolites of Awassi lambs. Anim. Feed Sci. Technol. 231: 131-137. https://doi.org/10.1016/j.anifeedsci.2017.07.006
- Oeztuerk H, Schroeder B, Beyerbach M, Breves G (2005). Influence of living and autoclaved yeasts of Saccharomyces boulardii on in vitro ruminal microbial metabolism. J. Dairy Sci. 88(7): 2594-2600. https://doi.org/10.3168/jds.S0022-0302(05)72935-0
- Pienaar GH, Einkamerer OB, Van der Merwe HJ, Hugo A, Scholtz GDJ, Fair MD (2012). The effects of an active live yeast product on the growth performance of finishing lambs. S. Afr. J. Anim. Sci. 42(5): 464-468. https://doi.org/10.4314/sajas.v42i5.4
- Raghebian M, Dabiri N, Yazdi AB, Bahrani MJ, Shomeyzi J, Raghebian A, Hatami P (2017). Probiotic Effect on Meat Quality and Carcass Parameters of Iranian Zandi lambs. J. Livest. Sci. 8: 163-168.
- SAS (2004). Statistical Analysis System, User's Guide.Statistical. Version 7th ed. SAS.Inst.Inc. Cary. N.C. USA.
- Tricarico JM, Harrison GA, Johnston JD (2006). Modeling Yea-Sacc ®1026 effects on ruminal function and performance in lactating dairy cattle within the framework of the CPM dairy ration analyzer. Proceedings of the 22nd Annual Symposium. Nutritional Biotechnology in the Feed and Food Industries. USA,72: 23-26.
- Zhang AW, Lee BD, Lee SK, Lee KW, An GH, Song KB, Lee CH (2005). Effects of yeast (*Saccharomyces cerevisiae*) cell components on growth performance, meat quality, and ileal mucosa development of broiler chicks. Poult. Sci. 84(7): 1015-1021. https://doi.org/10.1093/ps/84.7.1015