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USING ORANGE INDUSTRY BY PRODUCTS AS ENERGY SOURCE WITH DIFFERENT PROTEIN SOURCES IN RATIONS OF GROWING LAMBS

By

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B.Sc. Agric. Sci. (Animal Production), Fac. Agric., Cairo Univ., ١٩٩٧
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THESIS

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APPROVAL SHEET

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ABSTRACT

Thirty growing Rahmany male lambs (٥-٦ months old and weighed in average ٢٨,٩±٠,٩ Kg) were randomly assigned according to their body weight into six feeding groups (٥ in each). The effect of replacing ٥٠ % corn grains by the same amount of dried orange industry by-product (DOP), with different protein sources, with and without yeast addition on the performance of growing lambs through growth trial for ١٢٠ days was studied followed by digestibility trials on adult sheep. Six experimental rations, total mixed ration, consist of ٣٠ % alfalfa hay: ٧٠ % concentrate feed mixture were used in this experiment, the first three rations contained soybean meal (٤٤ % CP) as protein source plus corn grains as energy source (R١), or ٥٠ % corn replaced by the same amount of DOP (R٢) or R٢ plus ٣ g/h/d. yeast (*Saccharomyces cerevisiae*) (R٣), while, the other three rations contained corn gluten meal (٦٤ % CP) as protein source plus corn grains (R٤) or ٥٠ % corn replaced by the same amount of DOP (R٥) or R٥ plus ٣ g/h/d. yeast (R٦). The results showed that there were no significant differences in all nutrients digestibility and nutritive value as TDN among animals fed R١, R٢ and R٣. Animals fed rations R٥ or R٦ significantly *(P< ٠,٠٥)* improved all nutrients digestibility compared with other rations, while those fed R٣ or R٦ improved digestibility of EE compared with R٢ or R٥, respectively. There was a significant *(P< ٠,٠٥)* improvement of the nutritive value for R٥ as TDN and DCP by (٧,٦٧ and ٥,٨٢ %) and (٦,٧٨ and ٤,٤٨ %) respectively compared with R٢ and R٤, respectively. Ruminal pH, ammonia nitrogen and total volatile fatty acid had the normal curve for all treatments. Rations contained DOP significantly *(P< ٠,٠٥)* increased rumen acetate and decreased propionate and also, increased microbial protein synthesis and decreased pathogenic bacteria compared with rations contained ١٠٠ % corn grains. Blood parameters were generally unaffected by treatments and were in normal range. Average daily gain was significantly *(P< ٠,٠٥)* improved for lambs fed ration R٥ compared with other rations. Animals in R٢ had the lowest feeding cost being ٩,٧١ followed by R٥ had ٩,٩٥ L.E / Kg gain, respectively. It is concluded that ٥٠ % corn grains could be replaced by DOP in growing lambs rations supporting the growth of ruminal microbes and enhance feed conversion and reduce feed cost L.E / Kg gain.

Key words: Dried orange industry by-products, corn grains, soybean meal, corn gluten meal, yeast, growing lambs.

DEDICATION

I dedicate this work to whom my heart felt thanks; to my mother, my late father, my father -in-law, my brothers and sisters, my husband, my lovely daughters, son and all my family for their support, encouragement, help and creating a good atmosphere during the time of this study.

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LIST OF ABBREVIATIONS

ADF	Acid detergent fiber
ADG	Average daily gain
ADL	Acid detergent lignin
ALT	Alanine transaminase
AST	Aspertate transaminase
BU	Blood urea
CF	Crude fiber
cfg/g	Colony forming units per gram
CGM	Corn gluten meal
CP	Crude protein
DCP	Digestible crude protein
DE	Digestible energy
DM	Dry matter
DMI	Dry matter intake
DOP	Dried orange industry by-product
EE	Ether extract
FBW	Final body weight
FN	Fecal nitrogen
GOT	Glutamic-oxaloacetic transaminase
GPT	Glutamic-pyruvic transaminase
IBW	Initial body weight
Kg	Kilogram
L.E.	Egyptian pound
ME	Metabolizable energy
meq	milliequivalent
mg/dl	Milligram per deciliter
MJ	Mega joule
MN	Microbial nitrogen
MPS	Microbial protein synthesis
NB	Nitrogen balance
NDF	Neutral detergent fiber
NDSF	Neutral detergent-soluble fiber
NEI	Net energy intake
NFE	Nitrogen free extract
NH_3-N	Ammonia nitrogen
OM	Organic matter

RL	Rumen liquor
SBM	Soybean meal
SP	SoyPlus, expeller soybean meal
TDN	Total digestible nutrients
TG	Total gain
TL	Total lipid
TP	Total protein
TVFA's	Total volatile fatty acids
U/ml	Unit per milliliter
UN	Urinary nitrogen
YC	Yeast culture

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INTRODUCTION

Feeding by-products of crops and food processing industries to livestock is a practice as old as the domestication of animals by human. It has two important advantages (Grasser *et al*., ١٩٩٥), these being to diminish dependence of livestock on grains that can be consumed by human (which was almost certainly the primary original reason), and to eliminate the need for costly waste management programs (which has become very important in recent years as the world human population has increased and the amount of crop and food by-product has increased, particularly in developed countries).

In Egypt, the continuous increases in feed costs specially corn grains, locally produced or imported from abroad as a source of energy for human (biofuel), led to search for other alternative feedstuffs or by-products to be used as energy source in animal rations.

Citrus pulp is a by-product from citrus processing plants that produce juice, contains remaining peel, pulp, seeds, and rag of the citrus family (e.g., orange, lemons and grapefruit). It is the main by-product from the citrus-processing industry that is used as a feedstuff for ruminants.

Dried citrus pulp is typified (Arthington *et al*., ٢٠٠٢ and Bampidis and Robinson, ٢٠٠٦) by high concentrations of pectin (٢٢ to ٤٠٪) and approximately ٨٠٪ TDN and relatively low concentrations of CP (٧,٢ ± ٠,٢٪), which are similar to grains, fat (٣ ± ١,٠٪), NDF (١٩,٣ ± ١,٣٪), and ADF (١٦,٩ ± ٢٪; DM basis). Citrus pulp is high in digestible fiber, which makes it an excellent energy supplement. Pectin is the predominant carbohydrate in dried citrus pulp, and it is quickly