Effect of use of Chalconoids as Antioxidants on Milk Production and on Qualitative and Quantitative Properties of Milk in Zaraibi Goats

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By

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Study of Chalcones' Effect on Milk Production in Zaraibi Goats

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ABSTRACT

The present study aimed to evaluate the effect of chalcones on milk production and qualitative properties of milk in Zaraibi goats. Five chalcones have been synthesized *via* Clasien - Schmidt condensation under alkaline conditions. Structures of the synthesized chalcones have been confirmed by their melting point (mp), Infrared spectrum IR and Proton Nuclear Magnetic Resonance (^{1}H-NMR) spectra. Total antioxidant capacity (TAC) of the synthesized compounds were measured according to Phosphomolybdenum method, and the results indicated that, chalcone [1-(benzofuran-2-yl)-3-(4-methoxyphenyl)-prop-2-en-1-one] (**V**) has the highest antioxidant activity among the five synthesized chalcones.

Sixteen dairy Zaraibi goats have been divided into three groups according to their parity, milk yield, body weight and age. G1 (4 animals) served as control group and was fed the basal diet, G2 (6 animals) was fed the basal diet + 250 mg/head/day of chalcone **V** and G3 (6 animals) was fed the basal diet + 500 mg/head/day of chalcone **V** for a period of 90 days. Results showed insignificant increase in milk yield of the three groups (1.07, 1.07 and 1.14 L, respectively), in milk protein (2.80, 2.87 and 2.92%, respectively) and milk somatic cells (SCC) ($956.4*10^3$, $981.1*10^3$ and $1181.7*10^3$ cells/ml, respectively).While there were insignificant decrease in milk fat of the three groups (3.70, 3.45 and 3.31%, respectively), milk lactose (4.45, 4.45 and 4.36%, respectively) and total milk solids (11.67, 11.47 and 11.29%, respectively). Total antioxidant capacity of blood serum was insignificantly higher in G2 than G1 and G3 (2.86, 3.25, 2.83 mM/L, respectively). Findings indicate insignificant response of using chalcones on milk production and qualitative properties of milk as it may decomposed in the rumen or not absorbed by the intestine due to its large particles.

Key words: Chalcone, Antioxidant, Milk production, milk quality, Zaraibi goats.

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List of Abbreviations

Abbreviations	Meaning
^{1}H-NMR	Proton Nuclure Magnetic Resonance
AAE	Ascorbic Acid Equivelent
AOA	Antioxidant Activity
BHA	Butylated Hydroxy Anisole
CNS	Coagulase Negative Staphylococci
DMI	Dry Matter Intake
DMSO	Dimethyl Sulphoxide
DPPH	Diphenyl Picryl Hydrazile
FCM	Fat Corrected Milk
IC 50%	Inhibation Concentration of 50% of cells
IMI	Intra- Mammary Infection
IR	Infrared
m.p.	Melting Point
MRSA	Methicillin Resistant Staphylococcus Aurers
MTT	Microculture Tetrazolium Test
MW	Microwave
NSS	*Nigelaa Sativa Seeds*
PMN	Polymorphonuclear Neutrophiles
PTC	Phase Transfer Catalyst
r.t.	Room Temperture
SAS	Statistical Analysis System
SCC	Somatic Cell Counts
SNF	Solids Non- Fat
SPP	Streptococcus spp
SSA	Silica Sulphoric Acid
TAC	Total Antioxidant Capacity
TLC	Thin Layer Chromatography
TMS	Tetra- Methyl Silaine
TMY	Total Milk Yield
TMY 90	Total Milk Yield during the first 90 days
TS	Total Solids

Contents

Aim of The Work

Abstract

The present study aims to evaluate the effect of chalcones on milk production and qualitative properties of milk in Zaraibi goats. Five chalcones have been synthesized *via* Clasien- Schmidt condensation under alkaline conditions. Structures of the synthesized chalcones have been confirmed by their melting point (m.p.), Infrared spectrum IR and Proton Nuclear Magnetic Resonance (^{1}H-NMR) spectra. Total antioxidant capacity (TAC) of the synthesized compounds indicated that chalcone 5 [1-(benzofuran-2-yl)-3-(4-methoxyphenyl)-prop-2-en-1-one] has the highest antioxidant activity among the five synthesized chalcones.

Sixteen dairy Zaraibi goats have been divided into three groups according to their parity, milk yield, body weight and age. G1 (4 animals) serves as control group and was fed the basal diet, G2 (6 animals) was fed the basal diet + 250 mg/head/day of chalcone 5 and G3 (6 animals) was fed the basal diet + 500 mg/head/day of chalcone 5 as oral pills once daily for a period of 90 days. The results showed insignificant increase in G3 than either G1 and G2 in milk yield (1.14, 1.07 and 1.07 Kg, respectively), in milk protein (2.92, 2.80 and 2.87 %, respectively),and in milk somatic

cells (SCC) (1181.7*10^3, 956.4*10^3 and 981.1*10^3 cells/ml, respectively).While there are insignificant decrease in G3 than either G1 and G2 in milk fat (3.31, 3.70 and 3.45 %, respectively), milk lactose (4.36, 4.45 and 4.45%, respectively) and total milk solids (11.29, 11.67 and 11.47 %, respectively). Total antioxidant capacity of blood serum was insignificantly higher in G2 (3.25 mM/L) than G1 and G3 (2.86 and 2.83 mM/L, respectively). Findings indicate insignificant response of using chalcones on milk production and qualitative properties of milk as it may be decomposed in the rumen or not be absorbed by the intestine due to its large particles.

SUMMARY

Summary

Several reasons prompted us to use chalcones as antioxidant supplements in the dairy goat rations. Firstly, chalcones represent an important group of the polyphenolic family, which includes large number of naturally occurring molecules. In addition, chalcones possess an interesting spectrum of biological activities including antioxidant, antibacterial, anticancer, cytotoxic and immunosuppressive potential. The last and the most important reason is that chalcones can be synthesized *via* simple and efficient methods as Clasien-Schmidt condensation.

Improving the qualitative and quantitative properties of dairy goats' milk has a large number of merits. One of these merits is that milk of dairy goats improves the diet of many rural families. Also, it has a great nutritional value, since it is suitable for children who are allergic to cows' milk, patients with ulcers and sick elderly people.

The present study aimed to evaluate the effect of chalcones on milk production and qualitative and quantitative properties of milk in Zaraibi goats.

Five chalcones have been synthesized via Clasien-Schmidt condensation between acetophenone and benzaldehyde under alkaline conditions. Structures of the

synthesized compound have been confirmed on the bases of their melting points, IR and ^{1}H-NMR spectrum. Antioxidant activity of the synthesized compounds has been measured according to phosphomolybdenum method. Results indicated that chalcone (1-(benzofuran-2-yl)-3-(4-methoxyphenyl)-prop-2-en-1-one) (**5**) has the highest antioxidant capacity among the synthesized compounds. That is why we used chalcone **5** in our experiment.

Sixteen dairy Zaraibi goats have been chosen out of the flock and divided into three groups according to their milk yield, age, body weight of doe and parity. G1 (4 animals) served as control group and received the control ration (25% concentrate feed mixture and 75 % green berseem). G2 and G3 (6 animals each) served as experimental groups and received control ration besides 250 and 500 mg of chalcone **5**, respectively. Doses have been administrated as oral pills once daily for 90 days.

Milk yield was measured and recorded biweekly. Milk samples have been collected once monthly at the 1st day of lactation (zero time, before treatment) and every 30 days till the end of the experiment. Milk samples were analyzed for fat, protein, lactose, total milk solids and solids not fat percentages using Milko-scan (133 BN. FOSS