**Effects of Oregano Essential Oil in Sheep and Goats**



**Θεσσαλονίκη 2021**

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# Τίτλος μελέτης: Effects of oregano essential oil on the ruminal pH and microbial population of sheep

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**Περίληψη μελέτης:**

Στην παρούσα μελέτη, παρατηρήθηκε η επίδραση του αιθέριου ελαίου ρίγανης στο pH και στη μικροχλωρίδα του πρώτου στομάχου των προβάτων.

Παλαιότερες έρευνες έχουν δείξει ότι τα αιθέρια έλαια μπορούν να επηρεάσουν τη ζύμωση στον στόμαχο, να σταματήσουν την ανάπτυξη βακτηρίων και να βελτιώσουν την απόδοση.

Από τη μελέτη φάνηκε ότι η χορήγηση μικρής ποσότητας αιθέριου ελαίου ρίγανης μπορεί να επηρεάσει θετικά την πεπτική λειτουργία των προβάτων, καθώς και την μικροχλωρίδα του στόμαχου.

Οι ερευνητές προτρέπουν σε περαιτέρω σχετικές μελέτες, για την εξακρίβωση του μηχανισμού δράσης του ριγανελαίου.

**Abstract:** Oregano essential oil (OEO), which has antimicrobial properties, may be used for altering the ruminal pH and microbial populations of sheep, as observed by the altered volatile fatty acid patterns. To further elucidate the effects of OEO on ruminal pH and microbial populations of sheep, 3 German merino sheep × local sheep crossbred rams with permanent ruminal fistulas were randomly assigned to a 3 × 3 Latin square design with 12-d periods. The treatments were as follows: control (CON); OEO4: OEO supplied at 4 g•d-1; and OEO7: OEO supplied at 7 g•d-1. Starting on day 11, rumen fluid was collected at 0 h, and at 4, 8, 12, 24 and 48 h after supplying OEO, and then pH values of rumen fluid were immediately measured. The abundance of microbial populations was determined by using qPCR. The ruminal pH values were similar among the sheep from all treatments. The abundance of ruminal fungi was higher for the sheep supplied OEO7 compared with the sheep supplied CON and OEO4, especially at 4 and 12 h. The abundance of ruminal protozoa decreased with supplied OEO, indicating that OEO could inhibit the protozoa. The abundance of the total ruminal bacteria was similar for the sheep from all treatments, but R. flavefaciens, R. albus and F. succinogenes increased in the sheep supplied OEO4 compared with those in the sheep supplied CON, however, the sheep supplied OEO7 had higher abundances of R. flavefaciens than the sheep supplied CON. These results demonstrated that supplying OEO to sheep did not affect the ruminal pH but could shift the rumen microbial population to one with less protozoa. Supplying OEO can preferentially enhance the growth of certain rumen microbial populations, but the shifts were influenced by the supply rate. Therefore, supplying low amount (i.e. 4 g•d-1) of OEO could have positive effects on ruminal microbial populations, whereas supplying elevated doses of OEO could be detrimental to those same ruminal microbial populations.

**Conclusions:** The supplementation of oregano EO (4 g•d-1 or 7 g•d-1) had no effects on the ruminal pH and negative effects on the abundance of ruminal protozoa. In addition, supplementation with oregano EO increased the abundance of three primary cellulolytic bacteria (4 g•d-1) and the abundance of ruminal fungi (7 g•d-1). Our results suggest that supplying sheep with oregano EO could manipulate the rumen microbial. These results also demonstrate that adding a lower amount (such as 4 g•d-1) is beneficial to the ruminal microbial population, while adding higher (such as 7 g•d-1) amounts can be detrimental to the ruminal microbial population. However, the low number of animals used in this study, and the impacts of active components of oregano EO on rumen fermentation and the microbiota community also should be deepen studied in future.

# Τίτλος μελέτης: Natural Oregano Essential Oil May Replace Antibiotics in Lamb Diets: Effects on Meat Quality

*(Published: 12 May 2020)*

**Antibiotics 9.5 (2020): 248**

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**Περίληψη μελέτης:** Οι ερευνητές εξέτασαν την επίδραση του αιθέριου ελαίου ρίγανης σε αρνιά. Παρατήρησαν τα διάφορα στοιχεία της ποιότητας του κρέατος που μπορεί να επηρεάζονται, με την προσθήκη ριγανελαίου στη διατροφή των αρνιών.

Η έρευνα έδειξε ότι το αιθέριο έλαιο ρίγανης επηρεάζει θετικά την τρυφερότητα του κρέατος, καθώς και την διατήρηση ποιοτικότερου χρώματος για περισσότερες ημέρες. Επίσης, παρατηρήθηκε μικρότερη λιπιδική οξείδωση και καλύτερο προφίλ πτητικών λιπαρών οξέων.

Συμπερασματικά, οι μελετητές επιβεβαιώνουν πως το αιθέριο έλαιο ρίγανης έχει πολλαπλά οφέλη, όταν δίνεται σε αρνιά ως συμπλήρωμα διατροφής. Βελτιώνει τα οργανοληπτικά χαρακτηριστικά, καθώς και την συνολική ποιότητα του κρέατος.

*Η ποσότητα που προτείνουν είναι 0.3 γραμμάρια ριγανελαίου/κιλό τροφής.*

**Abstract:** A study was conducted to investigate the effect of oregano essential oil (OEO) and monensin sodium on the oxidative stability, colour, texture, and the fatty acid profile of lamb meat (m. Longissimus lumborum). Twenty Dorper x Pelibuey lambs were randomly divided into five treatments; control (CON), monensin sodium (SM, Rumensin 200® 33 mg/kg), a low level of OEO (LO, 0.2 g/kg dry matter (DM)), a medium level of OEO (MO, 0.3 g/kg DM), and a high level of OEO (HO, 0.4 g/kg DM). Dietary supplementation of OEO at any concentration lowered the compression strength in comparison with CON and SM. MO had the highest a\* values (7.99) and fatty acid concentration (C16:1n7, C18:1n9c, C18:1n6c, C20:1n9, and C18:2n6c) during storage for 7 d at 3 ◦C. Lipid oxidation was not promoted (p > 0.05) by the moderated supplementation of oregano essential oil; however, OEO at 0.3 g/kg DM showed a slight lipid pro-oxidant effect. Dietary supplementation of MO and SM had the same effect on colour, tenderness, and the fatty acid profile of lamb (L. lumborum). It was demonstrated that oregano essential oil was beneficial for lambs feeding, and it could be a natural alternative to replace monensin in lamb diets with improvements in the quality of the meat.

**Conclusions:** This study demonstrated that the dietary inclusion of 0.3 g (per kg of DM) of OEO increases lamb tenderness and, similarly to monensin and low oregano oil (0.1 g/kg DM) supplementation, it preserves the meat colour after 7 d of storage. Thus, oregano oil could be an alternative to monensin in lamb diets. The supplementation of oregano essential oil also significantly affected the fatty acid profile, increasing the content of C16:1n7, C18:1n9c, C20:1n9, and C18:2n6 in meat. This study demonstrated that oregano essential oil was beneficial for lamb meat quality. Overall, this study confirmed the remarkable beneficial effect of oregano essential oil on the colour, tenderness, lipid oxidation, and fatty acid profile of lamb meat, which is of significant importance, aiming to evaluate the benefits of phytochemicals to replace monensin and obtaining advantages in lamb meat quality. Further research is needed to identify the main metabolic pathway of oregano essential oil as well as the crucial active components that favourably alter the quality characteristics in lamb meat.

# Τίτλος μελέτης: Effect of dietary oregano oil supplementation on lamb meat characteristics

*(Published: 10 September 2007)*

**Meat Science 79.2 (2008): 217-223.**

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**Περίληψη μελέτης:**

Στην παρούσα μελέτη εξετάστηκε η επίδραση αιθέριου ελαίου ρίγανης στα χαρακτηριστικά του αρνίσιου κρέατος. Οι μελετητές παρατήρησαν τις μεταβολές στο κρέας, όταν προστίθεται ριγανέλαιο στη διατροφή των αρνιών για διάρκεια 2 μηνών.

Το βασικό συμπέρασμα της μελέτης είναι το γεγονός ότι το αιθέριο έλαιο ρίγανης προσδίδει αντιοξειδωτικά χαρακτηριστικά στο κρέας. Μετά τη συντήρηση του κρέατος (ψύξη-κατάψυξη), τα αρνιά που είχαν τραφεί με ποσότητα ριγανελαίου εμφάνισαν μειωμένη λιπιδική οξείδωση.

Επομένως, οι μελετητές καταλήγουν στο συμπέρασμα πως το αιθέριο έλαιο ρίγανης είναι ικανό να βελτιώσει τα χαρακτηριστικά του αρνίσιου κρέατος, κυρίως λόγω του περιορισμού της λιπιδικής οξείδωσης.

**Abstract:** The effect of dietary oregano essential oil supplementation on lamb meat characteristics was investigated. Eight male and eight female Chios lambs were divided into two equal groups. The first group was fed with the control diet consisting of concentrated feed and alfalfa hay, whereas the second group consumed the same diet, the only difference being that the concentrated feed was uniformly sprayed with oregano essential oil (1 ml/kg). Duration of the experimental period was two months. No differences were observed after oregano essential oil supplementation in final body weight (kg), body weight gain (g) and carcass yield (%). Tenderness of longissimus thoracis muscle, expressed as sarcomere length and shear force value, was not influenced by the treatment, whereas pH and colour parameters (yellowness–redness) appeared to increase (P < 0.05). Moreover, results showed that dietary incorporation of oregano essential oil exerted strong antioxidant effects retarding lipid oxidation (MDA formation) in meat during refrigerated and long-term frozen storage (P < 0.001).

**Conclusions:** Natural feed supplements appear to be an alternative to synthetic additives in animals’ diet. In the present experiment, dietary oregano essential oil administration is positively influenced by meat quality characteristics, mainly by retarding lipid oxidation. However, further study is needed to elucidate its exact action and establish its regular use in sheep husbandry.

# Τίτλος μελέτης: ***Effects of dietary dried Greek Oregano (Origanum vulgare ssp. hirtum) supplementation on blood and milk enzymatic antioxidant indices, on milk total antioxidant capacity and on productivity in goats***

*(Published: 1 September 2015)*

**Animal Feed Science and Technology 209 (2015): 90-97**

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**Περίληψη μελέτης:**

Στο συγκεκριμένο άρθρο μελετήθηκε η επίδραση του αιθέριου ελαίου ρίγανης σε γαλακτοπαραγωγές αίγες. Το πείραμα διήρκησε για 4 εβδομάδες και για την διεξαγωγή του χρησιμοποιήθηκε ελληνική ρίγανη (Origanum vulgare) από την περιοχή της Ικαρίας.

Η μελέτη έδειξε, για ακόμη μια φορά, τη σημαντική αντιοξειδωτική δράση του ριγανελαίου. Η δράση αυτή εμφανίστηκε στο αίμα των ζώων και στο γάλα που παρήγαγαν, γεγονός που προσδίδει στο γάλα ικανότητα συντήρησης για μεγαλύτερο διάστημα.

Επομένως, το αιθέριο έλαιο ρίγανης φαίνεται πως έχει την δυνατότητα να προσδίδει ισχυρή αντιοξειδωτική ικανότητα στις αίγες και, ταυτόχρονα, να περιορίζει την υποβάθμιση του γάλακτος που παράγουν μειώνοντας την οξειδωτική του αλλοίωση.

**Abstract:** The aim of the present study was to evaluate the effects of the dietary supplementation of dried Greek oregano (Origanum vulgare ssp.hirtum) as a whole plant on various blood and milk oxidative stress enzymatic indices, on milk total antioxidant capacity and on productivity in dairy goats. Twelve Alpine goats were used in a 4 week experiment and were allocated to 1 of 2 groups (CON, OR). The animals were fed 1.2 kg of alfalfa hay and 1.2 kg of concentrate mixtures (50 % basal and 50 % lactation ration) daily. The concentrate mixtures for the CON group were not supplemented with oregano, while oregano plants were incorporated into the lactation ration of the OR group, at a level of 30 g equivalent to a daily dosage of 1 ml of essential oil per animal. The goats were milked twice per day and the milk yield was recorded. At the end of each week of the experimental period, individual milk samples were obtained and analyzed for fat, milk and protein contents. Additional blood and milk samples were taken during the 3rd and the 4th week of the experimental period. The activities of the following antioxidant enzymatic indices were measured: superoxide dismutase, glutathione peroxidase, glutathione reductase, catalase in blood and milk, glutathione transferase in blood and lactoperoxidase in milk. The OR group showed a significant increase in glutathione peroxidase and glutathione reductase both in blood (P<0.01 and P<0.001 respectively) and milk (P<0.001 and P<0.001 respectively). In addition, the dietary oregano supplementation effectively enhanced FRAP values (P<0.001) of the milk. It can be concluded that the dietary intake of dried oregano plants positively affected at least partially, some enzymatic and non-enzymatic antioxidant defenses of blood and milk and thus, contributed to enhanced antioxidant capacity of milk.

**Conclusions:** The results of this study suggested that the dietary supplementation of dried oregano plants in lactating goats positively affected antioxidant system performance. Oregano plants exert antioxidant protection indirectly through antioxidant enzyme activation properties and directly through ROS scavenging by various antioxidant compounds contained in oregano. Thus, oregano plants as feed additives in ruminant diets may be a promising way of fortifying both the enzymatic and the non-enzymatic antioxidant system and consequently minimize the oxidative damage during the lactation period and the deterioration of milk quality.

# Τίτλος μελέτης: Composition, antioxidant capacity, intestinal, and immunobiological effects of oregano (Lippia palmeri Watts) in goats: preliminary in vitro and in vivo studies

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**Tropical Animal Health and Production 53.1 (2021): 1-12**

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**Περίληψη μελέτης:**

Στην συγκεκριμένη μελέτη, παρατηρήθηκε η επίδραση της ρίγανης σε αίγες. Τα φυτοχημικά στοιχεία της ρίγανης, έχουν πολλαπλά οφέλη για το ζώο που την καταναλώνει.

Από την μελέτη φάνηκε πως η ρίγανη επηρέασε θετικά την υγεία των αιγών. Ειδικότερα, παρατηρήθηκε αύξηση της αντιοξειδωτικής τους ικανότητας. Ακόμη, παρουσιάστηκε αντιφλεγμονώδης δράση και καλύτερη υγεία του εντέρου, μετά την πρόσληψη της ρίγανης.

Οι ερευνητές καταλήγουν στο συμπέρασμα ότι η ρίγανη ως πρόσθετο τροφής έχει θετικά αποτελέσματα και προτείνουν περαιτέρω μελέτες για την εξακρίβωση του μηχανισμού δράσης της ρίγανης.

**Abstract:** This study investigated Lippia palmeri Watt (oregano) phytochemical compounds, their antioxidant capacity, and immunological effects on goat peripheral blood leukocytes (PBL), and on the presence of intermediate polar compounds in goat feces fed dietary oregano. The polar and nonpolar fractions of L. palmeri W. were characterized and phytochemical contents and antioxidant capacity were determined. Twelve healthy Anglo-Nubian goats were used for the in vivo trials, which were randomly assigned to control fed with basal diet, or oregano group fed with basal diet + 2.6% (DM basis) dried oregano leaves. Goat peripheral blood leukocytes (PBL) were isolated for the in vitro study, and PBL were stimulated with oregano extracts at 100 and 150 μg/mL after 24 h. For the in vivo trial, dietary oregano (2.6% on DM basis) was evaluated in the goats for 90 days. Relatively high abundance of carvacrol and thymol phytochemical compounds was found in oregano. The highest antioxidant capacity of oregano extracts was detected at 100 and 150 μg/mL. Nitric oxide production, phagocytosis, and superoxide dismutase activities increased (p < 0.05) in stimulated PBL with oregano extracts, whereas the pro-inflammatory (TNF-α and IL-1β) transcription and antioxidant (CAT and GPX-4) genes downregulated. In the in vivo experiment, dietary oregano enabled the detection of nine compounds found in goat feces, from which caproic (C6) was in a high relative quantity compared with the control group. Oregano has phytochemical compounds with strong antioxidant capacity that protect cells against oxidative stress damage and could modulate immune response and feces composition in goats.

**Conclusions:** The preliminary studies demonstrated that (1) L. palmeri W. has common phytochemical compounds found in other oregano species that account for its strong antioxidant capacity; (2) its extracts promote cellular antioxidant and antiinflammatory responses in goat leukocytes; and (3) its dietary supplementation (2.6% dry matter based on the total formulated diet) in adult Anglo-Nubian goats increased the production of caproic acid and compounds associated with the improvement of intestinal health. The beneficial effects of oregano for ruminants remain almost elusive, so this study opens the path for further investigation and potential applications of L. palmeri Watts on animals.

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