

The effect of dietary rosemary dried leaves and annual stems and oregano essential oil on the performance and egg characteristics of laying hens.

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SUMMARY

The principal compounds which are responsible for the distinctive antioxidant activity of rosemary as well as sage belong to the phenolic diterpenes. Carnosic acid and carnosol were shown to be the major phenolic diterpenes in leaves.

Oregano obtained by drying leaves and flowers and stems of *Origanum vulgare subsp. hirtum* plants is well known for its antioxidative activity. Carvacrol and thymol, the two major phenols that constitute about 78-82% of the essential oil, are principally responsible for this activity.

This experiment was conducted in order to evaluate the effect of supplementation of dried rosemary leaves and stems, as well as oregano essential oil in layers' diets, on their performance and egg traits. One hundred and forty four Löhmann hens (32-wk-old) were allocated at random into six dietary treatments (M, T, R₁, R₂, E₁ and E₂) according to the completely randomized experimental design (C.R). Each treatment was comprised of four replicates of six layers each.

The experiment lasted 60 days and the laying hens were fed either a basal diet based on corn and soybean meal (M treatment) or a basal diet supplemented with either 40g of α-tocopherol acetate/100 kg of diet (T treatment), 500g of dried rosemary leaves and stems/100 kg of diet (R₁ treatment), 1000g of dried rosemary leaves and stems/100 kg of diet (R₂ treatment), 100g of Ecodiar/100 kg of diet (E₁ treatment) or 200g of Ecodiar/100 kg of diet (E₂ treatment).

The α-Tocopherol acetate which was used as feed supplement was obtained from Roche Products Ltd. (Hertfordshire, UK) and the oregano essential oil from Meriden Animal Health Ltd (UK).

The oregano essential oil was in the form of a powder commercially known as Orego- Stim (Ecopharm Hellas, SA, Kilkis, Greece) that contained 5% oregano essential oil and 95% natural feed grade inert carrier. The major components of the essential oil were carvacrol (79.6%), p-cymene (8.7%), thymol (2.5%) and g- terpinene (2.1%).

Egg number was recorded daily per replicate and treatment. Feed consumption for the birds of each replicate was recorded every week. Every fifteen days, twelve layers per treatment were weighed in order to estimate the changes in their weight. Every week, two eggs per replicate, 48 eggs in total, were collected at random in order to measure their weight. Of the 48 eggs, 24 were used, one egg per replicant, in order to measure the eggs' traits.

The results of the present study showed that the addition of dried rosemary leaves and stems as well as oregano essential oil in layers' diets did not significantly affect either the performance of laying hens or the egg traits. No distortion of the oviduct nor any significant effects on the kidneys' condition were found.

Key words: Laying hens, rosemary, oregano oil, performance, egg traits.

EFFECT OF LACTATION AND PROLIFICACY ON MILKABILITY, COMPOSITION AND SOMATIC CELL COUNT OF CROSSBRED GOAT MILK SAANEN x NATIVE GREEK BREED

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SUMMARY

Forty-three goat dams (Saanen x native Greek breed) were randomly selected from the experimental herd of the School Farm of TEI of Thessaloniki with aim to study the effect of lactation and prolificacy on milkability, composition and somatic cell count of their milk. Twelve, thirteen and eighteen animals were in 1st, 2nd and 3rd + parities, respectively. Twenty three goats have kidded twins while 20 singles. The experiment lasted 24 weeks (from weaning of kids (60±5 days)) till the 32nd week of lactation. The milking parlor was of "Casse" type of 1 x 12 side by side with 1 x 6 milking units. The goats were milked at a vacuum level of 44 kPa, a 90 pulsations/min and a 50:50 pulsator ratio. The nutrition was based on 1.5 kg alfalfa hay (in the stable) and on 1 kg pellets in the milking parlor (total daily intake: 23.4 MJ ME and 310 g CP). Milk yield was recorded every 2 weeks both in the morning and afternoon milking using the recorder jars of the milking parlor. Twelve milk controls were carried out. During each month (3rd, 5th, 7th, 9th, and 11th controls) milk samples were collected for milk analysis (~ 60 ml). The following variables were studied: milk partitioning (machine milk, machine stripping milk, hand stripping milk, total machine milk, daily milk yield), milk composition (fat, protein, lactose), somatic cell count (SCC) and microbiological quality of milk (CFU/ml). Separate milk samples were collected to analyze for subclinical mastitis (using California and Whiteside methods). The experimental data were analyzed by ANOVA using GLM Procedure of the SAS (1995). The results of the experiment have shown that: milk partitioning was influenced by stage of lactation. Machine milk (MM) was the most variable milk fraction. There was a progressive diminution of this fraction (P<0.001), while the machine stripped (MSM) and hand stripped (HSM) fractions did not fluctuate significantly. As the lactation period progressed a drop of MM percentage was observed (P<0.05). Parity has influenced the milkability of goats. So, in the dams of the 2nd and 3rd parities milk partitioning was improved (more MM and less MSM and HSM, P<0.05). Prolificacy has influenced positively the milkability of goats (P<0.05). Lactation stage has influenced also the milk composition (P<0.001), the somatic cell count (P<0.001) and the microbiological quality of milk (P<0.01). Fat and lactose percentages were influenced by the parity of goats (P<0.01), while fat percentage and by prolificacy (P<0.01). Somatic cell count and the microbiological quality of milk weren't affected by parity and prolificacy. Milk partitioning resulted in satisfactory levels (MM=72.6%, MSM=17%, HSM=10.4%). Mean fat, protein and lactose percentages resulted as follows: 4.1, 3.3 and 4.3 %, respectively. Mean milk yield of goats was 1.6 l/day. Mean somatic cell count was 1.042 x 10³ SCC/ml and the mean number of microbic colonies 327 x 10³ CFU/ml. Mastitic conditions were absent in all experimental goats during the lactation period. As a conclusion it could be said that goat backcrosses Saanen x Local Greek goat breed were characterized by higher milk yield and satisfactory milkability comparatively with local goats. Milk composition was in intermediate levels. Although the SCC was about 1-million/ml goats were found to be free of subclinical mastitis. Microbiological milk quality was inside the EE recommendations.

Keywords: Lactation; Prolificacy; Milkability; SCC; CFU

STRESS FACTORS AFFECTING PRODUCTION IN INTENSIVE AND SUPER-INTENSIVE REARING SYSTEMS IN FINFISH CULTURE

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ABSTRACT

The aim of the present paper is to evaluate existing possibilities for determining the financial production effects of chronic stress on growing farmed finfish, especially when intensive and super-intensive production systems are applied. Generally, extensive production systems are characterized by the use of earth ponds and natural food, combined or not with supplementary artificial diets (raw or formulated). On the other hand, the exclusion of soil as the main constructive material for rearing spaces and the involvement of artificial feeds only (mainly pelleted dry diets) are the principal features of intensive production systems. In these cases, rearing spaces could be raceways, tanks or net cages, indoor or outdoor, constructed of any kind of material (concrete, plastic, glass, wood, etc.) apart from soil and through which a significant amount of untreated water flows continuously. While super-intensive production systems generally belong to the intensive systems group, they are characterized by a continuous reuse of considerable amounts of rearing water. Results of hundreds of papers published since the early '50s have shown that a great number of factors promote stress in cultured finfish, affecting their physiological and health status. Also, it is well recognized that the effects of most of the stressors are unavoidable, mainly due to the domesticated conditions that living finfish must experience during their rearing periods. The total number of stressors investigated can be allocated into the following three major groups characterized by considerable interactions:

- a) Stressors of biological origin. *-rearing density, nutrition, fish health status.*
 - Rearing density is one of a number of terms (crowding, stocking density or rate, loading density, carrying capacity, density index) applied to describe the relationships existing at any point in time between farmed finfish populations and their living environment (medium, space). Generally, rearing density or crowding stress effect is characterized by the "psychological" suffering of farmed finfish expressed by species-specific behavioural requirements for rearing space (number of specimens/m³). On the contrary, loading density and stocking density, which are used to refer to the maximum biomass of fish per rearing water volume unit (kg fish/kg water, kg/m³) express the stress effects caused by improper water physicochemical characteristics. It should, however, be mentioned that despite the various conclusions from previous research, the precise level of the involvement of behavioural and rearing water quality deterioration in resulting stress effects associated with higher or even lower densities (growth rate reduction, increased food conversion ratio, etc.), might not be adequately clear and distinguishable.
 - Generally, chronic stress production-effect caused by improper nutrition could be demonstrated by a growth rate reduction caused either by an imbalanced nutrient and energy content of the diet, or by insufficient feeding practices or by both. Nevertheless, a clear link between improper diet chemical composition and chronic stress administration has yet to be reported.
 - Cultured finfish health status, as chronic stress effect at any point in time, apart from nutritional deficiencies, may result from either finfish interactions or infectious diseases. Interactions between fish are usually expressed as the results of either dominance hierarchies, which are mainly based on fish size, or aggressive behaviour, which is largely based on fish living ethology.
- b) Stressors of environmental origin. *-rearing water parameters, rearing space constructions, management.* The chronic stress effect of environmental origin stressors has been the subject of a great number of investigations, mainly

because of the extremely high variety of factors that may act as stressors. The vast majority of the reported results identifies stress effect caused by rearing water parameters (water temperature, dissolved gases concentration and chemical composition) as the primary stressor, and much more than those related to insufficient constructions (lighting and tank colour as well as tank shape, in association with water flow characteristics) and even more than to management inadequacy.

- c) Stressors of combined origin. Generally, because of their combined involvement, it is only their final chronic stress effect that can be estimated and not the exact contribution of each one of stressors implicated. The number of possible combinations is virtually unknown due not only to the large number of the stressors but also to the different levels of the involvement that each one performs at any given point.

Although stress effect in the farmed fish industry may account for a great deal of the total production cost, the exact cause and extent remain unclear. Furthermore, it remains doubtful whether this uncertainty is due to the industry's lack of pertinent information, or its reluctance to acknowledge, or even to its underestimation of the importance of chronic stress effects. It should be clearly stated that as long as the effects of stress on fish growth and quality are poorly understood, the financial results for the fish farming industry will remain far below their optimum level.

COMPARATIVE STUDY OF SOME REPRODUCTIVE TRAITS OF CHIOS, KARAGOUNIKI AND FLORINA EWE LAMBS

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SUMMARY

The aim of this study was to investigate the reproductive performance of Chios, Karagouniki and Florina ewe lambs. A total of 120 ewe lambs, 40 per breed, 20 early-born (November – December) and 20 late-born (January – February) were used for this purpose on the farm of T.E.I. (Florina). The onset of ovarian function, the age of first oestrus exhibition, mating percentages and oestrus returns, ovulation rates, lambing percentages, prolificacy and embryonic losses were studied.

The onset of ovarian function was monitored by progesterone determination from blood samples taken from the age of 4 months till the 16th day after mating. Oestrus exhibition was detected by rams' daily inspection from the age of 4 months. Ovulation rate was determined for each animal after laparoscopy at the 8th day after mating. Embryonic losses were calculated as the difference between ovulation rate and prolificacy.

The results have shown that: high percentages of all animals attained puberty during the first year of age (onset of ovary function: 77.5, 100 and 92.5%, exhibition of first oestrus: 77.5, 90 and 87.5% for Chios, Karagouniki and Florina ewe lambs, respectively). Chios ewe lambs attained puberty at an older age (onset of ovarian function: 247.76±32.07 *versus* 227.29±32.07 and 237.87±25.77 days $P<0.01$, first oestrus exhibition: 271.33±26.57 *versus* 251.75±24.22 and 259.37±27.2 days, $P<0.01$, for Chios, Karagouniki and Florina, respectively). In each breed early-born animals attained puberty at an older age (ovarian function: Chios 254.16±15.73 *versus* 232.37±11.22 days, Karagouniki 255.60± 16.30 *versus* 214.54±28.35 days, Florina 249.10±20.75 *versus* 223.60±24.94 days for the early and late-born, respectively, $P<0.01$, first oestrus exhibition: Chios 282.84±21.82 *versus* 244.10±13.64 days, Karagouniki: 275.50±10.02 *versus* 236.33±18.97 days, Florina 273.53±23.87 *versus* 238.69±16.69 days, $P<0.001$) for the early and late-born, respectively.

All animals exhibited silent ovulations. Thus, ewe lambs in each breed exhibited first oestrus earlier ($P<0.01$) than the onset of ovary function. The mean weight of ewe lambs during first oestrus was greater than 60% of the weight of the adult ewes for each respective breed. Chios breed exhibited higher ovulation rate and prolificacy (ovulation rate: 1.7±0.66 *versus* 1.42±0.58 and 1.1±0.31 prolificacy: (1.41±0.5 *versus* 1.31±0.47 ($P<0.05$) and 1.03±0.18 ($P<0.01$) for Chios, Karagouniki and Florina, respectively). However, Chios breed exhibited higher percentage of embryonic loss (15.55% *versus* 8.11 and 6.25% for Chios, Karagouniki and Florina breeds, respectively). In each breed early-born animals exhibited higher ovulation rate and prolificacy than the late-born (ovulation rate: Chios 1.75±0.89 *versus* 1.68±0.58, Karagouniki 1.78±0.44 *versus* 1.23±0.56, $P<0.01$, Florina 1.19±0.40 *versus* 1.00±0.00, prolificacy: Chios: 1.42±0.50 *versus* 1.38±0.52, Karagouniki 1.56±0.53 *versus* 1.18±0.39 ($P<0.01$), Florina 1.06±0.25 *versus* 1.00±0.00, for the early and late-born, respectively). However, in each breed early-born ewe lambs exhibited a higher percentage of embryonic loss compared to the late-born ones. (Chios: 15.62% *versus* 14.29%, Karagouniki 12.50% *versus* 4.67% ($P<0.01$), Florina 10.53% *versus* 0.00 $P<0.001$). Mating percentages were high for all breeds. Oestrus returns were low for all breeds. Lambing percentages were high for all breeds.

The above results show that all the breeds attain puberty at an early age but genetic differences exist among them in ovulation rate and prolificacy. Chios breed is more prolific than the other breeds. All breeds are well adjusted to the continental climate of Florina however the higher puberty percentages of Karagouniki and Florina breeds and earlier onset of puberty than in Chios breed indicate a better adjustment to local conditions. The breeders must take this fact into account.

Nutritional effects of pelleting or extrusion processing on feed for growing pigs

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ABSTRACT

An experiment was conducted to determine the effect of pelleting or extrusion processing on apparent nutrient digestibility and the nutritive value of feed when fed to growing pigs. The experiment was designed as a 3×3 Latin square with nine pigs in three groups and three diets. Pigs with a mean initial body weight of 10±1 kg were placed in metabolism crates where they remained until the end of the experiment. They were offered a diet based on maize and soybean meal in row meal form (M) or in row pellet form (P) or in extruder-processed pellet form (E). The pellet diet was steam pelleted at 75 °C into 4.0 mm pellets. The extruded diet was extruder-processed at 145 °C for 2 min at 35 bar pressure. Pelleting of the diet increased (P 0.01) dry matter (DM), ether extracts (EE), crude fibre (CF), nitrogen free extracts (NFE), hemicelluloses, cellulose, NDF, ADF and energy digestibility by 1.80, 7.70, 82.0, 1.52, 34.40, 100.70, 58.50, 38.20 and 2.60, % respectively. Extrusion of the diet had an additional positive effect on digestibility of DM, EE, crude protein, CF, NFE and energy. Both pelleting and extrusion of the diet decreased (P 0.001) ash digestibility, tended to decrease feed intake, and had no effect on growth rate, however, extrusion of the diet improved the feed conversion ratio (P 0.05). The nutritive value of the feed (MJ DE/kg) increased by 4.4 % with pelleting processing and by 7.4 % with extrusion processing, compared to the row meal diet. The results of the present study show an improvement in dietary value of the feed when grower pigs are fed pelleted or, even better, extruded rather than row meal diets of similar composition.