

P-166

Performances, carcass and some meat quality traits in lambs fed with extruded linseed (*Linum usitatissimum* L.) and oregano (*Origanum vulgare* L.)

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Extruded linseed has been extensively used in ruminant feeding due to its positive effects on the gastro-intestinal function, content of proteins characterized by high solubility and ω -3 fatty acids. The aim of the research was to evaluate the effects of feeding diets containing extruded linseed, with or without the association of oregano as a natural antioxidant, on lamb growth, meat production and quality. The trial was carried out on 18 Gentile di Puglia breed male lambs, divided into three groups of six subjects each, according to age and live weight, and fed *ad libitum* with the following treatments beginning on 20 days of age: C, control group; L, feedstuff containing extruded linseed (3%); L+O, feedstuff containing extruded linseed and sun dried oregano plants in bloom (0.6%). During the trial lambs suckled also ewes' milk, therefore the three feedstuffs were offered simultaneously to lambs' respective mothers. Once a week lambs were individually weighed to determine the average daily gain (ADG) and the amount of feed given and refused was recorded to evaluate the voluntary feed intake. Lambs were slaughtered at 40 days of age. Carcasses were evaluated and sectioning data were recorded. The Longissimus lumborum muscle was analyzed for chemical composition. Data were processed by ANOVA using the GLM procedure, and means were compared by Student's t test. Diet did not affect lamb final live weight (13.94, 14.64, 13.93 kg, respectively for C, L and L+O). However, both the diets containing extruded linseed slightly improved the ADG (0.228, 0.212 g/d, respectively for L and L+O) in comparison with the control group (0.205 g/d). Hot and cold carcass weights and net dressing percentages did not significantly differ among treatments. Lower amount of fat was recorded in the L and L+O groups for the dissection of the loin (10.30-10.59 *vs.* 11.13%) and hind leg (4.92-5.39 *vs.* 5.84%). As for meat chemical composition, feeding extruded linseed in association or not with oregano faintly lowered the meat intramuscular content of fat in the loin in comparison with the control group (3.56-2.98 *vs.* 3.87%). Based on the results obtained in this trial, it would be interesting to extend the length of the dietary treatments in lambs by increasing their age at slaughter.

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P-167

Improving sustainability of poultry production by feeding insects: state of the art and perspectives

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The market for poultry products (egg and meat) is growing worldwide owing also to the absence of cultural or religious obstacles. Dietary protein sources represent the primary production costs. Soybean meal is the most used protein source in the diet formulations for broilers and laying hens. However due to its ever-increasing price, the sustainability of this production chain is becoming critical, in particular in some developing countries. Therefore, alternative feed protein sources, locally available and sustainable are required. The use of insects as an alternative source of protein in animal feeding is becoming globally more appealing, especially for its sustainability. In addition, insects (adult, larval and pupal form) are consumed naturally by wild birds and free-range poultry. The rural poultry farming in the economy and food security of developing countries has been momentous. Studies have shown the feasibility of using insects as an alternative feed source or as complementary feed source for poultry. Grasshoppers, darkling beetle, crickets, cockroaches, termites, lice, stink bugs, cicadas, aphids, scale insects, psyllids, beetles, caterpillars, flies, fleas, bees, wasps and ants have all been used as complementary food sources for poultry. Soybean or fish meal in broiler chicken or laying hen diets have been successfully replaced at low inclusion levels by black soldier flies (*Hermetia illucens*), housefly (*Musca domestica*), mealworms (*Tenebrio molitor*) and silkworm (*Bombix mori*) pupae. Insect inclusion in poultry diets ranged between 0.2 to 20 % without affecting growth performance or, in some cases, by improving it. An obstacle to the use of insect meals in poultry diets is the lack of information about nutrient digestibility in commercial poultry farms. Recently, Schiavone et al. (2015), have estimated the nutrient and apparent metabolizable energy values for mealworms and black soldier flies pupae used in chickens feeding. The use of insects as sustainable protein-rich feed ingredient in poultry diets is technically feasible. Insects can be reared on low-grade bio-waste substrates transforming them into high-quality proteins. Furthermore, invertebrates are a raw material included in the Feed Register Material of the EU. Although they are currently authorized only for pet feeding, insect-derived feed could represent in the near future a suitable ingredient for poultry, too.