g/L), glucose (12.87 g/L). The effect of orange molasses concentration (7%, 10%, 12%) on SCP production was conducted in 1000 ml flasks cultivated in a vibrating shaking incubator at 30°C, pH 5.5 for 72h. The initial amount of C. krusei for each concentration was 2.05±0.11 Log CFU/ml. At 0, 24, 48 and 72 hours chemical and microbiological analysis were carried out. Cell dry weight of cultures was analyzed by centrifuging, washing the pellet and drying at 105°C to constant mass. Protein content in drying cells was measured and sucrose, fructose and glucose were analyzed using enzymatic assay. For the yeast count Dichloran Rose-Bengal Chloramphenicol Agar plates were used. After 72 hours the yeast reached: 7.90 Log CFU/ml at 7%, 7.09 Log CFU/ml at 10% and 6.80 Log CFU/ml at 12%. Cell dry weight was 3.15 g/L at 7%, 7.65 g/L at 10% and 4.16 g/L at 12% and the protein content in dry cells of the strain was 37.55% on Dry Matter - DM, 30.42% DM and 34.02% DM respectively. These results suggested that C. krusei might be applied effectively to produce SCP using orange molasses as a low-cost substrate. Further investigations are currently underway.

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Nutritional traits and phenolic content of dried Olive Cake from three different cultivars of Olea Europea grown in Sicily (Italy) for livestock feed

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Olive tree culture has a great economic and social importance in the Mediterranean area. In addition olive oil industry generates large amounts of by-products such as olive cake, vegetation water, twigs and leaves. Olive Cake (OC) has a little economic value and always it is used as animal feed. Aim of this work was to characterize three varieties of stoned and dried olive cake (Biancolilla, Cerasuola and Nocellara) cultivated in the same area (Trapani, Sicily, Italy), from the 2012-2013 campaign, and milled in the same oil-mill. In this regards were quantified: moisture, ash, crude protein (CP), ether extract (EE), crude fiber (CF), neutral detergent fibre (NDF), acid detergent fibre (ADF) and sulphuric acid lignin (ADL), total extractable polyphenols (TEPP) and the degree of acidity. The results do not show significant differences in the three varieties. Protein content of the olive cake varied from 7.65±0.54% DM (Cerasuola) to 9.05±0.14% DM (Nocellara). Ash content varied from 4.04±0.14% DM (Biancolilla) to 5.00±0.96% DM (Nocellara). The use of stoned olive cake determines low values of ADL in the range of 15.95±0.85% DM (Cerasuola) to 16.90±0.12% DM (Nocellara) compared to samples with kernel. This result is important because the lignin is indigestible and therefore this product is better for the ruminant nutrition. However, an improved processing could lower further the lignin value. The analysis of TEPP showed values between 4.58±0.66 DM (Biancolilla) Ãì 6.00±1.22 DM (Cerasuola). These values are not very high because probably the polyphenols are highly sensitive to increased of temperature and light. The phenolic compounds in olives are recognized as potentially bioactives and may have antioxidant and therapeutic properties. OC is considered a rich source of phenolic compounds with a wide array of biological activities, then, it could be very important to find a conservative drying process. The amount of crude lipids, from 29.05±3.86% DM Cerasuola to 29.62±3.01% DM Nocellara, is another important result of these varieties since the values are much higher than the data present in the literature. A similar product can be considered of great interest in animal feed industry, although the stoned and dried processes should be optimized to improve and preserve its nutritive and functional values.

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Farming insects for feeding pigs: constraints and opportunities

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Farmed insects are among novel protein sources for pig feeding. In Europe, insect producers and pig breeders have to comply with rather complex rules and legal requirements, mainly related to the feed (or "substrate) fed to the insects. Annex III of Regulation (EC) 767/2009 lists a number of materials that are prohibited as substrate for insects, such as feces and "household waste". Substrates have to comply also with EU regulations on animal proteins (Regulation 1069/2009 and the implementing 142/2011): according to these regulations, some (animal protein) sources such as manure, gut content, dead-in-shell poultry, and fallen stock are prohibited as substrate for insects. Insects are expected to be increasingly used in Europe as protein replacers in animal nutrition, and the potential species for use in pig

diets are Hermetia illucens (black soldier fly), larvae of Musca domestica (common housefly), and Tenebrio molitor (yellow mealworm). Black soldiers larvae meal is a suitable ingredient in growing pigs diets, being valuable in particular for its protein, lipid and Ca content and palatability (Newton et al., 1977). The unbalanced aminoacid content of prepupae meal may be a limiting factor in diets for early weaned piglets; additional refinement, such as cuticle removal and rendering, may be necessary to make it more suitable for piglets. The common housefly (M. domestica) maggot is of particular interest because it can grow on a large range of substrates and transform wastes into a valuable biomass rich in protein and fat. Sows and piglets fed maggot meal did not show any adverse effect on performances and health, and on sensorial property of meat (Bayandina and Inkina, 1980). Positive results were observed on weaned pigs fed a soybean based diet supplemented with 10% maggot meal to replace fishmeal (Viroje and Malin, 1989). Also yellow mealworm (Tenebrio molitor) could be suitable in animal feeding due to its high content of crude protein (47-60%) and fat (31-43%), but at the moment no information is available for pigs and ruminants. Future research on insect meal is needed, focused in particular on safety hazards helping EU to assess conclusive laws on the use of insect meals in pig diets.

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Insects as innovative protein source for fish feeds: a brief review

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Global fish production has grown steadily over the last 5 decades reaching a total of 158 million tons in 2012 with more than 42% coming from aquaculture. From 1980 to 2012, the global aquaculture production grew at an average annual rate of 8.6% and this increasing trend is expected to continue. In order to feed the world population (9 billion in 2050), food production must increase by 70% and aquaculture production will need to increase by 133%. An increased availability of quality aqua feeds is required for sustaining such rates of increase in aquaculture production. Fish meal (FM) is the optimal protein ingredient in fish feeds and still widely used. However, aqua feed production is under increasing pressure due to limited supplies and increasing price of FM. This means that FM will likely continue to be an important ingredient, but it will increasingly be used in combination with other ingredients. Plants already deliver the majority of the protein to diets for farmed fish due to the abundance, potential for increased production and low cost. However, inclusion of vegetable meal in aqua feeds (mainly soybean meal ‚Äì SBM) is limited since a number of adverse effects are observed. Furthermore, the massive utilization in animal feeding of vegetable meal poses severe environmental issues. Therefore, scientific research must focus on new protein sources able to save biodiversity and to guarantee the sustainability of aquaculture productions. FAO indicates insects as innovative source to be employed in feed, due to their high nutritional value, especially in terms of crude protein (CP) content. In aquaculture, trials have shown that their use is possible with good growth performances even if some amino acid limitations have been highlighted. Insect meal could thus make a significant contribution to the sustainable development of the aquaculture industry. In this scenario, the Committee on ‚ÄúUsing innovative sources of protein in animal feed‚Äù, appointed by the ASPA, is studying and discussing recent advances in feed research towards innovative new high protein feedstuff to be included in feeds. Different topics are focusing on insect meal, microalgae and animal by-products processed with innovative techniques that can be more sustainable and available on a global basis.

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Role of resistant starch from different sources on the *in vitro* production of short-chain fatty acids in a pig model

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There is increasing interest in incorporating nutrients that may act as potential prebiotic sources in pig diets, including resistant starch (RS). Pig colonic bacteria ferment RS to short-chain fatty acids (SCFA) that exert several physiological effects related to energy supply and renewal of intestinal cells. The aim of this work was to evaluate whether the fermentation of RS from different starches may influence SCFA fermentation patterns and related kinetics. An *in vitro* experiment based on enzymatic digestion followed by fermentation with faecal inoculum was conducted and 5 native purified starches were tested. Each ingredient was pre-treated with a pepsin-pancreatin hydrolysis and 200 mg of each hydrolysed RS residue was then incubated in