

The significance of the project:

Livestock production, as well as the agriculture sector, are facing challenges of the 21st century. Water deficiency which is already noticeable is going to deepen, and consequently reducing the yield of crops. Following, the competition for food resources between farm animals and consumers will increase. Unfortunately, drinking water management remains at the low level. Only in Poland, as much as 9 million tonnes (worth € 40 million) of organic matter (rich in water) is wasted, and stored on the landfills, generating boosted greenhouse gas emissions and having a negative impact on behavioral changes of wild animals. Besides, according to the amendment of Polish law (Dz. U. 2018, poz. 2430), at the beginning of 2023, the use of genetically modified (GM) feed materials will be forbidden, mainly soybeans imported from the USA, Brazil and Argentina. Due to this fact the research for alternative sources of protein and dietary energy in the poultry industry, which uses as much as 98% complete mixtures based on GM materials, is needed. It should be noted that Poland as the leader in poultry meat production in the European Union has made attempts to increase the share of rapeseed products and legumes in the broiler chicken diets. Apart from the nutritional aspects of the above-mentioned materials, it should be remembered that their yield is strictly dependent on environmental conditions (water availability).

The project proposed an alternative solution according to the environmentally sustainable production idea and the 4R strategy, i.e. reducing waste production, reusing products, recycling and recovery obtaining energy from waste. Insects are natural ingested feed by birds in nature. Their production is based on organic material which was not used in human nutrition. The water capacity in vegetables and fruits is sufficient for the rapid growth of larvae, without requiring the introduction of an additional source of drinking water. Additionally, *Hermetia illucens* (BSF) larvae have the greatest market potential due to the short life cycle and the ability to bio-convert low-value material into highly rich insect biomass. Preliminary studies have shown that fat obtained from BSF larvae is rich in medium-chain fatty acids, including lauric acid, which has health-promoting properties. Besides, it was noted that BSF fat can effectively replace soybean oil (GM) in poultry diets. Unfortunately, the lack of knowledge about BSF fat energetic value and physiological and immunological responses during its implementation excludes this alternative source of energy from practical animal nutrition.

The aim of the project:

As part of the project, it is planned to carry out 3 independent experiments on broiler chickens to assess the energetic value of BSF fat; calculating nutrient digestibility and energy availability coefficients throughout the entire rearing period; to characterize the effect of fat on the gastrointestinal tract microbiota, as well as its biostructure; assessing bone quality as an indicator of welfare and determining the physiological and immune response of broiler chickens. Moreover, the final product (breast meat) quality will be assessed, as well as the palatability test will be done.

Expected effects:

The project will significantly increase the available knowledge on the use of insects in animal nutrition as an alternative to GM and environmentally unfriendly materials, in line with the strategy of sustainable animal production. In addition, due to the expected positive effects of the alimentary factor on the modulation of intestinal microbiota, physiological and immunological responses, it will be possible to define fat obtained from BSF larvae as a functional feed. The obtained results of the project will allow developing the national potential of the alternative energy sources production derived from insect biomass, and consequently increasing the independence of the state from imported feed materials.