

ANNOTATION

The dissertation work of Yessenbayeva Zhanar Zheniskyzy on the topic “Development on the basis of vermiproductions of new biological active compounds and identifying the scope of their application” submitted for the degree of Doctor of Philosophy (PhD) in specialty 8D05204 - “Ecology”

General job description.

In general, many unfavorable environmental problems are rapidly growing in the world; they, in turn, have a negative impact on the environment and human health. For the socio-economic development of our country, it is necessary to pay special attention to such issues as the production of environmentally friendly products, minimization of agricultural and industrial waste and their recycling. These problems can largely be solved through the correct and effective use of new, promising, rapidly developing areas of modern biotechnology through the disposal of organic and inorganic production waste. Vermitechnology is widespread among them. Vermitechnology is considered one of the most environmentally efficient areas of biotechnology.

In this regard, this dissertation examines ways to effectively use vermiproductions obtained by vermitechnology in agriculture (livestock and crop production). The work is aimed at reducing the load of chemical fertilizers used in agriculture on the soil ecosystem and obtaining environmentally friendly products while ensuring environmental safety.

Relevance of the research topic.

1992 The UN Environment Protection and Efficient Use of Resources concept adopted the concept of “sustainable development”. In this regard, sustainable development is considered in several aspects (the main three: economic, environmental, social). Among them is ensuring the co-evolution of nature and society, man and the biosphere, harmony between them in the ecological aspect; ensuring restoration of damaged ecosystems; identification of specific measures for the efficient use of water; taking coordinated actions aimed at land use, sustainable agricultural development, conservation of biological diversity, etc. Our republic still retains the status of a state with environmentally vulnerable territories and unresolved environmental problems. Therefore, special attention in the country is paid to the development of scientific research aimed at solving issues related to environmental safety, environmental protection, rational and integrated use of resources. 2013 of the Republic of Kazakhstan In the concept of transition to a “green economy”, special attention is paid to the rational use of agricultural land and soil protection. Economic models that take environmental factors into account, such as the green economy and the bioeconomy, influence sustainable development. In this regard, the circular bioeconomy is interconnected with other sectors within manufacturing, forestry and water management structures.

It should be noted that in the European Union, for example, approximately 956 million tons of agricultural biomass are produced annually, 54% of which are staples such as cereals, fruits and tubers, and the remaining 46% are waste products such as plant leaves and stems.

Accelerated intensive land degradation in the agricultural system of Kazakhstan characterizes the fact that the creation of environmentally friendly technologies that make it possible to control physicochemical, biological and other processes in the soil is especially relevant. Mineral chemical fertilizers, especially commonly used in agriculture, damage the soil ecosystem and agricultural products. From the point of view of achieving agrochemical (fertilizer production), environmental (disinfection) efficiency, there is a prospect of introducing biotechnological methods for processing organic waste with earthworms and obtaining vermicompost. Agriculture is one of the key sectors of the economy and the basis for ensuring food security for the population. In this regard, it is relevant to expand the range of genetically non-modified environmentally friendly products to improve livestock products and increase their productivity.

Purpose of the work: Development of new composite mixtures of a wide range of biological activity using vermitechnologies and their use in agriculture in order to obtain environmentally friendly products.

Research objectives:

To achieve this goal, the following tasks were considered in the work:

- study the scientific basis of vermitechnology, which uses red Californian worms for processing animal and crop waste;
- study of the composition and properties of vermitechnology products (vermicompost, worm biomass);
- providing innovative methods for obtaining new insecticidal fertilizers and their use to increase crop yields by increasing soil fertility;
- introduction into production of new insecticidal compositions to combat melon pests based on sulfur-containing waste from the chemical industry.

The object of research is vermicompost, biomass of worms, melons (melons, watermelons, pumpkins), agricultural waste and sulfuric acid production and their products.

Research methods.

Widely used methods for determining chemical, physicochemical, biological, etc. were used as a methodological basis. properties, qualitative and quantitative compositions of the studied objects. Certified measuring instruments that meet modern requirements, updated methods, state standards and other regulatory documents were used to carry out the work under study. The research work was carried out in the laboratories of the Scientific Research Institute "Ecology" of the Ahmed Yasawi University and the Czech Agrotechnical University (Ceska Zemedelska Univerzita V Praze) of the Department of Agroecological Chemistry and Plant Nutrition. Field tests were conducted on agricultural land in rural districts.

Research tools – (Vario Macro cube analyzer, Agilent technology 7000 ICP-OES spectrometer, Elementar, UV-Vis Spectroscopy, KFK ZOMZ).

The aim of the work is to develop new compound mixtures of a wide range of biological activity using vermitechnologies and their use in agriculture in order to obtain environmentally friendly products.

Scientific novelty of research.

- new results characterizing the fertilizing and insecticidal properties of mixtures consisting of vermicompost and sulfur dioxide waste;
- the results of a detailed metagenomic analysis of the microbiological composition of vermicompost;
- optimal results that determine the environmental and economic effectiveness of biologically active agents.

Protected provisions:

- scientific substantiation of the results of the analysis of the chemical and microbiological composition of vermicomposts;
- new highly effective feed additives based on the biomass of Californian red earthworms, containing essential and essential amino acids;
- use of complex organic-mineral insecticidal fertilizers containing waste from sulfur production and vermicompost in the fight against melon pests (melon fly);
- economic and environmental efficiency of the proposed vermiproductions.

Consistency and reliability of scientific conclusions and recommendations set out in the work:

- with a clear formulation of research problems, the use of widely used methods of mathematical statistics, analytical chemistry, soil science and measuring systems in accordance with modern requirements;
- confirmed by a sufficient number of laboratory and production experiments, their mutual compatibility, as well as satisfaction with the results of experimental and industrial testing of the developed proposals.

Practical significance and implementation of the work.

A new insecticide-fertilizing agent has been developed, which has been subjected to production tests in the agricultural fields of the Turkestan region during the cultivation of melons. The test results were formalized by recommendations, acts of implementation on the effectiveness of using the proposed complex insecticidal fertilizer to increase yields and obtain environmentally friendly products. The effectiveness of the results obtained was determined by the conditions of soil fertility, improving the quality of melon products.

Materials obtained as a result of research can serve as an information basis for creating environmental projects.

Scientific results, their validity and novelty.

The scientific basis of vermitechnology, which uses red Californian worms for processing animal and crop waste, has been studied. The physical, chemical and microbiological properties of vermicomposts were fully studied by the researcher. Micro- and macroelements in vermicompost were determined by optical emission spectrometry (OES).

It has been established that feed additives obtained from the biomass of Californian red worms have an optimal effect on farm animals and birds. The results of experimental studies have proven the effectiveness of using red Californian worms as a feed additive for domestic animals and birds.

It has been proven that a mixture consisting of sulfur waste, vermicompost and bentonite improves the agrochemical properties of soils and creates conditions for an increase in the number of beneficial microorganisms. It has been established that the most common bacterial species in cattle manure are Actinomycetaceae, Actinobacteria, Acidobacteria, Alphaproteobacteria, Gammaproteobacteria, Deltaproteobacteria.

The results of the study are documented and confirmed by acts of production implementation.

Compliance with the main directions of scientific development or government programs.

This dissertation corresponds to the plan of research work on the following topics: "Production of fortified biomass of red Californian worms and feed protein vermid additive in the form of granules" commercialization grant of JSC "Science Fund" (No. 0017-18-GK, 2018 - 2021) and "Development and the introduction of environmentally feasible and effective technologies for processing solid household and industrial waste with the production of secondary raw materials and marketable products (using the example of the territory of Turkestan-Kentau-Otyrar)" (AR05130297, 2018-2020) Order of the Science Committee, Ministry of Education and Science of the Republic of Kazakhstan.

Personal contribution of the author.

The author's personal contributions include:

- the goal and objectives set during the dissertation work were completed in full;
- carrying out the theoretical and practical parts of the dissertation, processing, discussing, interpreting the results obtained and preparing them in the form of scientific publications;
- organization of production tests and implementation of work results;

All the main results, conclusions and scientific innovations presented in the dissertation were carried out by the researcher.

A description of the doctoral student's contribution to the preparation of each publication.

Based on the results of scientific research, the doctoral student prepared and published 6 articles under the guidance of scientific supervisors, including 4 articles in journals of the Committee for Quality Assurance in Science and Higher Education, 1 article in a journal included in the Scopus / Web of Science database and 2 articles in another publication.

The main scientific principles and results of the dissertation work reflecting the author's research are presented at the following domestic and international scientific and practical conferences, seminars: scientific conference "Satpayev Readings 2020" (Almaty, 2020); II International Scientific and Practical Conference "Ecology and Biodiversity conservation" (Almaty, 2019); International Scientific and Practical Conference practical conference of young scientists "Fundamental research and innovations in molecular biology, biotechnology, biochemistry" dedicated to the 80th anniversary of Academician Murat Aitkhozhin (Almaty, 2019); Proceedings of the International Conference "Scientific research of the SCO countries: synergy and integration" (China, 2022); International Scientific Conference " Sustainable Process Integration Laboratory Scientific Conference: Energy, Water, Emission & Waste in Industry and Cities" (November 14-15, Brno, Czech Republic 2022); International Scientific Conference "2nd International Scientific Conference "European Research Materials" (April 6-7, Netherlands 2023); International Scientific and Practical Conference "Issues of modern Scientific Research" (Chisinau, Moldova 2020); Student Scientific Forum – Moscow, Russia 2020, 2022.

The structure and scope of the dissertation.

The dissertation is presented on 135 pages of computer typesetting and consists of an introduction, literature review, research methods, conclusion and list of sources used, applications. The dissertation is illustrated with 21 tables and 27 drawings. The list of references includes 203 sources.