N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF BIOLOGICAL AND MEDICAL
ISSN 2224-5308
Volume 2, Number 308 (2015), 69 – 73

UDC 63.631.8

DIFFERENT UTILIZATION OF AGRICULTURAL WASTE BY VERMICOMPOSTING

N. A. Abdimutalip, G. B. Toychibekova, K. T. Abdraimova, A. M. Duysebekova

Международный казахско-турецкий университет им. Х. А. Ясави.
E-mail: gazi_toychibekova@mail.ru

Keywords: utilization, waste, vermicomposting, Californian worm, biohumus.

Abstract. The problem of rational use of waste of agriculture is many-sided and is in many respects caused by specifics of processing industry. The largest reserve of economy of material resources, expansion of the range, and increase in production, increase of productivity of the overworking enterprise is complex uses of this waste.

In the territory of the cities, the agricultural enterprises, livestock complexes, poultry farms, the enterprises of food and processing industry different types of the waste of a vegetable and animal origin which is potentially subject to biodegradation are formed. First of all, the waste of the enterprises of agro-industrial sector, corpses of animals and birds, veterinary seized properties revealed after veterinary and sanitary examination in the markets, lethal points, the meat-processing enterprises, and other objects which are engaged in transportation, processing and preparation of raw materials of an animal origin (figure 1) concern to them.

The majority of the by-products and waste which are formed after processing of agricultural raw materials is characterized by a valuable chemical composition and can be used for production of the various valuable and necessary industry for a national economy.

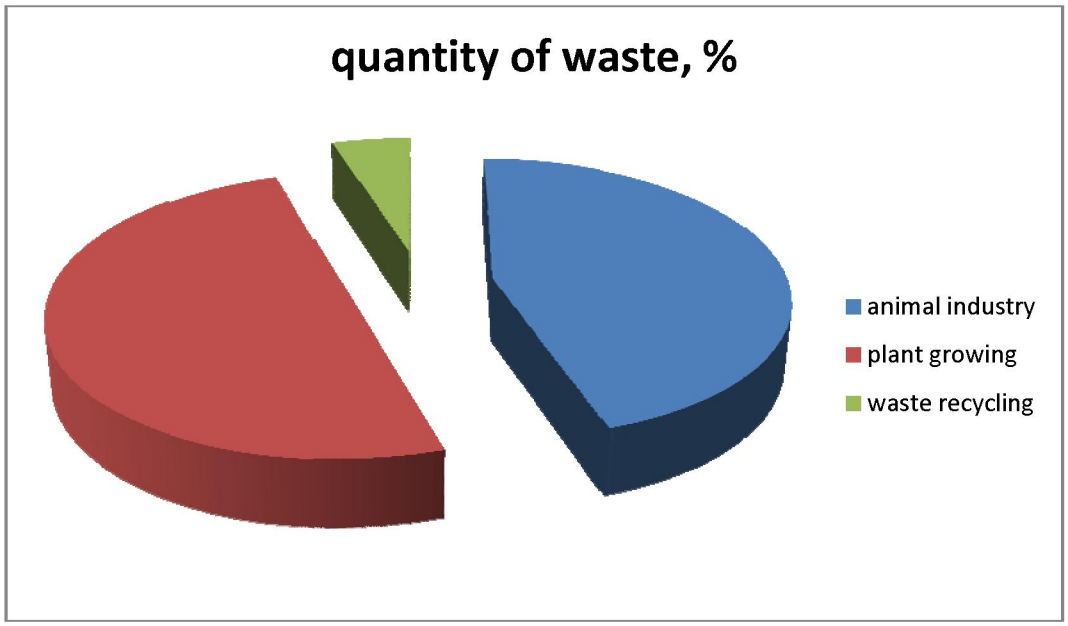

Figure 1 – Share distribution of agricultural waste

When processing grain by-products - bran, a muchka, a germ which are of a great nutrition value for the person as contain a significant amount of vitamins and microcells are developed.

When processing raw materials of an animal origin, for example, at the meat-processing enterprises, it is carried out collecting blood, collecting and processing of endokrinnofermental raw materials, intestinal raw materials, receive fodder products, fermental elements, fodder flour, a dry vegetable and animal feed, skins, a feather of a bird, a horn and a hoof for production of consumer goods, rogo-hoofed raw materials for technical application and for production of amino-acid preparations and many other things.

When processing raw materials of a phytogenesis, for example, treacle molasses, being withdrawal of sugar production, develops ethyl alcohol, glitserbetain, food and fodder yeast, food acids (lemon and dairy), glyutamin acid, glutamate sodium, vitamin B 12, solvents. From a cotton peel and cores of ears of corn - fodder yeast, furfural, ethyl alcohol, tetrahydrofurile alcohol, furan connections, acetic acid, food glucose, dry feeds for animals. From bards (waste of brewing production) - baker's yeast, glycerin, a betaine, fodder yeast, B12 vitamin, sulfate ammonium, glutamate sodium, biomizin, a forage for cattle [1, 2].

Waste of animal industry and especially poultry farming strongly pollutes environment. In many countries nation-wide and regional programs for reduction of negative pressure of this waste upon ecology work. Search of alternative methods of recycling is actual and today the next ways are offered: export on fields of a native dung, manure or drains, a composting, processing of manure and a dung on a forage, application of biopower methods and new technologies of utilization of a dung, creation of fish-breeding and biological ponds, etc. When exporting livestock waste on fields there is a number of problems. First, transportation of enormous quantity of drains (the content of solid of 2-5%) demands considerable funds, secondly, the soil, an underground and surface water catches invasive, infectious and toxic elements, thirdly, it conducts to accumulation of nitrates, copper and zinc in grain, a grass and water sources. In this regard in some states of the USA, for example, forbade application of a native bird's dung as fertilizer. According to the calculations which are carried out in size of a popular equivalent, manure without litter/ dung on the level of chemical environmental pollution by 10 times are more dangerous in comparison with household waste. Manure without litter/ dung treat category of unstable organic contaminants and according to World Health Organization more than 100 types of various causative agents of diseases of animals and the person are a transfer factor. The composting method, demands the special platforms, equipment and a large amount of peat, straw and other materials reducing moisture content. At observance of technology receive a biohumus of high quality, however to 30-40% of nutrients it is lost in the form of gases [3, 4].

There are modern technologies of utilization and processing of waste of poultry farming and animal husbandry. In England the bird's dung is fermented, processed formic acid and with additives of molasses fed to bull-calves. The Delaval firm has more than 30 options of biological disinfecting of manure. On one of technologies manure is directed scrapers and the conveyor to the centrifuge where to 95% of the weighed particles separate from moisture. The firm fraction from 36% of solid is maintained by 3 months in special storage, then granulate and give to cattle together with a silo. In Moldova pork manure humidity of 80-85% was subjected to acid hydrolysis. The firm fraction (lignin) went on fertilizer, and liquid - for receiving fodder yeast. In Canada for preparation for feeding manure is mixed previously with straw, then sowed with disputes of mushrooms. As a result receive the high-protein feed suitable in food not only a ruminant, but also monogastritical animal. In the USA poultry farming waste including a laying, use as environmentally friendly fuel for heating of rooms and receiving electricity.

Now the most perspective way of utilization of vegetable waste and waste of vegetable growing is the vermicomposting. Its application allows to increase efficiency, ecological stability and the self-regulating ability of agro ecosystems. In the world literature the vermitechnology is considered as an element of environmentally friendly agricultural production. Characteristic feature of this biotechnology is possibility of processing by a red Californian worm (figure 2) of the wide range of organic waste: manure of all animal species, dung, rainfall of treatment facilities, waste agricultural and processing industries.

Use Californian or other selection of a worm (for example, the gold prospector" in Russia) was widely adopted in the USA, Canada, England, Japan, Italy. Thus three aims are pursued: recycling, receiving fodder protein and increase of fertility of the soil.

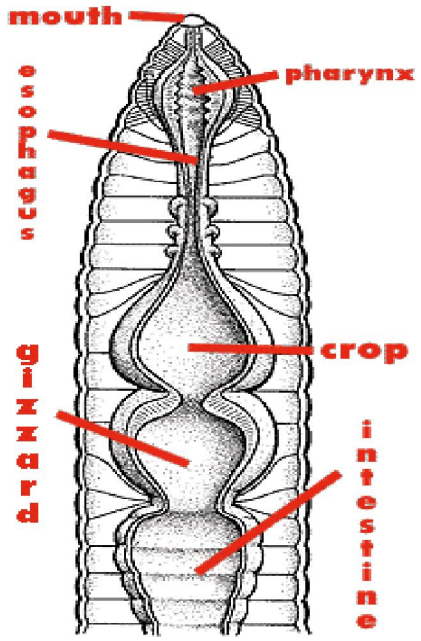

Figure 2 – Structure of a Red Californian Worm

This stage of cultivation of worms and receiving a qualitative biohumus demands special attention and preparation. Worms are occupied together with a nutritious substratum, evenly distributing them on a surface. At a bookmark in compost on each square meter 750–1500 worms are put.

Worms don't like bright light and therefore the box or a compost heap need to be closed dark air-permeable material.

Care of worms is reduced to maintenance of temperature, loosening and watering of ridges (boxes). One of the leading conditions in activity of compost worms is humidity of a substratum. They are very sensitive to humidity fluctuations, especially to its decrease. Watering for maintenance of humidity of compost at the level of 75–80% is carried out by means of the watering can with small openings which was previously defended (3–5 days) water with the temperature of 20-24 °C. Application of technology of processing of manure and organic waste of the industrial enterprises by means of earthworms will help to restore fertility of soils, to return them resistance to a water and wind erosion [5].

More and more people now understand that food have to be environmentally friendly. In the West the vegetables which are grown up on a biohumus are much more expensive, than received on manure or mineral fertilizers. It is known that in Arab Emirates stack on lifeless sand to 50 cm of the biohumus brought from Europe and, using an artificial irrigation, receive till three and more crops in a year of environmentally friendly production that allowed the countries of this region to turn from the import countries of agricultural production to the export countries. Record harvests are reaped in Israel where also apply a biohumus. The biohumus by 4–8 times surpasses manure and composts in the maintenance of a humus. The chemical composition of a biohumus is presented in figure 3.

Unlike compost it doesn't possess inertness of action (table 1) and promotes sharp increase of productivity (to 30%), the vegetative period at plants thus is reduced by two-three weeks. So, for example, addition of a biohumus in comparison with humus increases a beet crop by 27%, potatoes – for 19,7%, and in comparison with peat – for 15%.

Difference of a biohumus from simple organic fertilizers is very essential: it contains a large number of water-soluble forms of nitrogen, phosphorus and potassium – the most necessary substances. Microcells too pass into more mobile form. The maintenance of available water-soluble fractions in a biohumus the also very high. It is especially important during the first period of growth and development of plants. However the raised content of nitrogen if to use a biohumus in pure form, can negatively affect sprouts, that is detain and even to oppress them development. Thus, the biohumus should be mixed with peat or with the soil [6, 7].

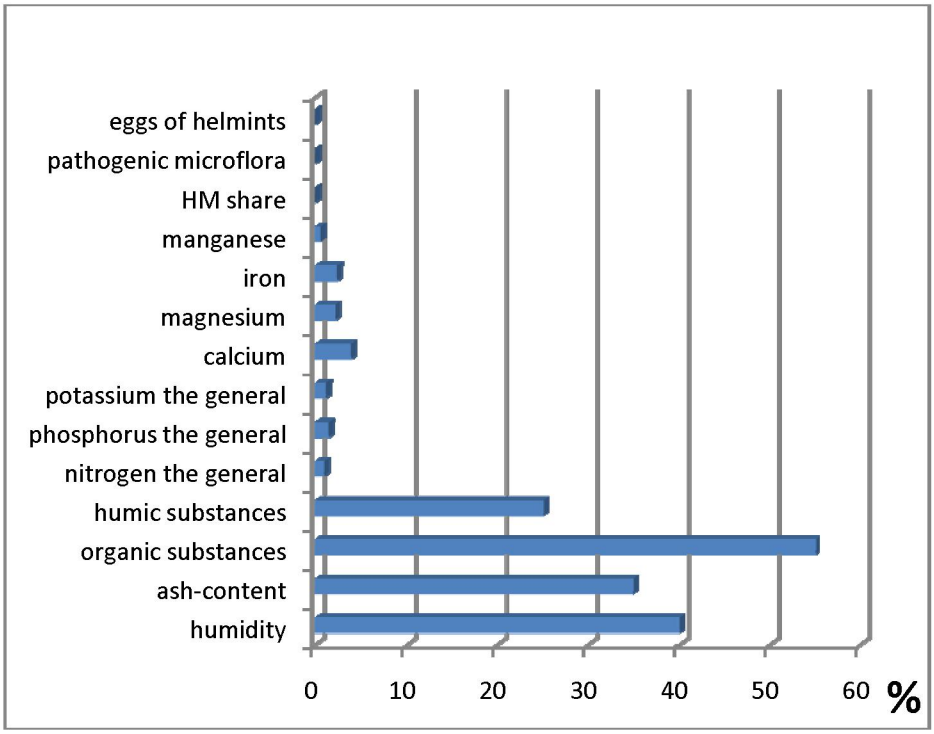

Figure 3 – Chemical composition of a biohumus

Table 1 – Comparative characteristic of compost and vermicompost

Parameters	Compost	Vermicompost
pH	7,80	6,80
Total of nitrogen, including what is in organic compounds, %	0,80	1,94
Nitrogen nitrate, particle on one million	156,50	902,20
Phosphorus, %	0,35	0,47
Potassium, %	0,48	0,70
Calcium, %	2,27	4,40
Sodium, %	<0,01	0,02
Magnesium, %	0,57	0,46
Iron, particle on one million	11690,00	7563,00
Zinc, particle on one million	128,00	278,00
Manganese, particle on one million	414,00	475,00
Copper, particle on one million	17,00	27,00
Pine forest, particle on one million	25,00	34,00
Aluminum, particle on one million	7380,00	7012,00

The biohumus possesses also useful technological properties: doesn't burn, has optimum parameters of porosity and water deduction, has no smell, it is pleasant to hold it in hand. The mechanical structure allows to treat it as with loose solid. When the biohumus gets to the soil even if it clay, dense and heavy mechanical structure, occurs its accelerated structuring. The favorable water-air mode for development of root system is created. Duration of action of a biohumus – 5 years. Thus for a storage time the biohumus can even dry, but won't lose the qualities.

Besides, the biohumus possesses bactericidal properties and differs in biological purity. The biohumus increases efficiency of salad cultures by 30%, beets – for 45% and potatoes – more than for 50%. Thus quality indicators of fruitful production improve, synthesis of valuable nutrients amplifies: sugars, starch, ascorbic acid (table 2). The content of nitrates in fresh production decreases to 50%.