

The quality of local raw materials of different origin and ways of their rational use in agriculture

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The purpose. To study agrochemical potential of local raw of different parentage and methods of its rational use in agriculture. **Methods.** Analysis of local raw was conducted according to certified procedures with the subsequent statistical analysis of data; synthesis and consolidation of data obtained are also used. **Results.** Agrochemical and physical-and-chemical characteristics of local sources of raw materials of different parentage are brought and analysis on availability of potential humus-formers is carried out. Technological aspects of processing raw into fertilizers and features of their rational application in agriculture are considered. **Conclusions.** Rational application of local sources of raw materials is of vital importance for turnover regulation of matters in farming agriculture and procreation of balance of humus in soils as the basis for stable development of farming agriculture. It is proved that with organic raw the multiple complex arrive in soil of various on chemical composition, level of sustainability and reactivity of organic compounds. That causes significant reclamative potential of organic fertilizers. Diversification and specificity of local sources of raw materials demand theoretical and technological justification, development of normative provision of production and application of fertilizers on their basis.

Key words: local source of raw materials, organic fertilizers, reclamative potential of fertilizers, composts, waste processing, normative documentation on fertilizers.

Formulation of the problem. Limitation of negative impact of wastes on the environment is a global problem that effects on all spheres of life and activities. In Ukraine, this problem has become especially sharp because of large amounts of waste and lack of adequate long-term response to the dangers created by them [5]. Waste management affects the balance of economic development of Ukraine in environmental and resource aspects. Therefore it is the urgency of developing a complex of legal, technical, scientific, managerial and other requirements and standards both nationally and internationally.

Systemic solution of the complex problem of improving efficiency of the use of local raw materials as the leading factor of reproduction of soil fertility and crops' productivity is due to significantly need to expand fundamental and applied research for developing of adaptive technologies that meet environmental requirements and current market [6, 2].

The purpose of the research – to explore fertilizing and ameliorative capacity of local raw materials of different origin and ways of their rational use in agriculture.

Methods. Analysis of local raw materials was carried out by certified methods: moisture and solids content by GOST 26713-85; ash content GOST 26714-85; total nitrogen content by GOST 26715-85; total phosphorus content by GOST 26717-85; total potassium content by GOST 26718-85; pH by GOST 27979-88; organic matter content by GOST 27980-88; group composition of humus by Tyurin in modification of Kononova–Byelchikova.

Results. The use of agricultural wastes and wastes of processing industry needs to take into account the following aspects:

- waste accumulation leads to output of large areas of land from economic use. Therefore it is necessary to implement waste management system with their rational utilization;
- presence of toxic substances in traditional and non-traditional organic fertilizers in condition of the absence of control over their composition and excessive soil application can lead to pollution;
- the main value of organic waste is organic matter content, which often coincides with composition and properties of soil humus [7, 4].

It was established that by the main agrochemical parameters composition of local raw materials with different origin varies widely (table 1).

1. Agrochemical characteristic of local raw materials

Sample	Solids, %	pH	Content of, %		Content of total, % indrymatter			Ctot %	Conversion coefficient in conditional fertilizer
			ash	organic matter	N	P ₂ O ₅	K ₂ O		
Cattlemanure(standart)	25,0	7,2	50,0	50,0	2,00	1,00	2,40	21,0	1,0
Cattlemanure	88,2	7,9	40,8	59,2	2,15	2,04	1,46	30,1	1,1
Raw chickenmanure	18,6	7,6	43,0	57,0	4,91	6,68	2,85	30,2	2,5
Chickenmanurelong-termstorage	73,0	8,3	46,8	53,2	3,36	4,38	2,56	23,6	1,8
Porkmanure	89,1	6,4	6,3	93,7	2,27	1,08	0,34	44,1	0,8
Peat	41,0	5,1	20,1	79,9	2,42	0,21	0,10	41,7	0,6
Sapropel	25,1	7,0	37,5	62,5	2,90	0,80	0,14	9,1	0,7
Bottomsludge	93,5	6,8	97,0	3,0	0,48	0,11	1,01	1,7	0,3
Municipal sewage sludge	65,4	6,4	60,3	39,7	2,85	3,82	0,42	22,4	1,3
Sewage sludgeof leatherindustry	14,3	7,5	38,0	62,0	3,72	3,71	0,29	26,0	1,4
Sewage sludgeof gelatinproduction	46,9	10,5	58,3	41,7	1,02	0,47	1,52	4,4	0,5
Waste ofalcoholproduction	-	5,6	10,0	90,0	3,73	0,06	6,51	17,5	1,8
Wasteofsugarproduction	59,8	8,7	56,5	43,5	0,70	0,54	0,05	2,1	0,2
Sawdust	65,2	9,1	2,0	98,0	0,73	0,03	0,52	48,5	0,4
Nitrogenwaste ofgelatinproduction	84,4	6,7	51,5	48,5	5,82	10,30	0,67	18,9	2,9

Local raw materials of organic origin are significant (and in some cases are the most important) sources of organic matter in arable soils. Research on an evaluation of organic fertilizers as former of humus unfortunately are very limited and are still not complete until now.

To assess the role of organic fertilizer as former of humus, first of all, the data on their chemical composition, not only in terms of total content of nutrition elements, but also of their organic matter is necessary. Whereas organic fertilizers are very diverse, we should recognize the need for detailed studies of quality evaluation of organic part of local raw materials. The specific feature of chemical composition of majority of organic raw materials compared with crop residues is "ready" humic acid content [9]. A quantity of these compounds is different and relates primarily to content in organic fillers, and partly also a degree of humification process during biocomposting of raw materials; but this fundamental feature should be taken into account during considering of nature of transformation of organic fertilizers in soil.

Considerable variability of local raw materials necessitates analyzing samples in certified laboratories (with branch certification), which will provide the basis for the rational use of them in agricultural practice.

Recently, as complete fertilizer and substrate for growing various plants various composts play an important role. In many countries, composting of organic waste has become a branch of industry in recycling them into fertilizers and soil improvers. But at the moment in the world there is no single standard of quality of compost.

Today in the world composting is a deal of businesses, farms, research and production associations. Unfortunately, in our country, in many cases, production and practical use of composts are made without adequate scientific and technological support and without proper agrochemical and sanitary control. National scientific literature contains very few and often conflicting information from agrobiological, ecological and economic evaluation of composts, their influence on fertility of different types of soils and productivity of agrobiocenosis.

2. The composition of the organic matter of local raw materials

Sample	Ctot, %	Pyrophosphate extraction			Cha/Cfa	Humification degree	Ntot, %	C/N
		Ctot	Cha	Cfa				
Cattlemanure	30,1	<u>6,9</u> 23	<u>4,2</u> 61	<u>2,7</u> 39	1,6	14	2,4	13
Raw chickenmanure	30,2	<u>5,1</u> 17	<u>1,1</u> 21	<u>4,0</u> 79	0,3	4	4,9	6
Chickenmanure long-term storage	23,6	<u>3,3</u> 14	<u>2,0</u> 61	<u>1,3</u> 39	1,6	9	2,7	9
Porkmanure	44,1	<u>7,7</u> 17	<u>3,1</u> 40	<u>4,6</u> 60	0,7	7	2,3	19
Composted porkmanure	29,5	<u>2,8</u> 10	<u>2,0</u> 72	<u>0,8</u> 28	3,5	7	1,2	25
Sapropel	34,8	<u>4,7</u> 14	<u>2,1</u> 45	<u>2,6</u> 55	0,8	8	3,9	9
Municipal sewage sludge	22,4	<u>2,9</u> 13	<u>0,9</u> 31	<u>2,0</u> 69	0,4	4	2,3	10
Sewage sludge of leather industry	26,0	<u>7,0</u> 27	<u>2,1</u> 29	<u>5,0</u> 71	0,4	8	3,7	7
Sewage sludge of gelatin production	4,4	<u>1,0</u> 22	<u>0,1</u> 14	<u>0,8</u> 86	0,2	2	1,0	4
Nitrogen waste of gelatin production	18,9	<u>10,</u> 958	<u>3,6</u> 33	<u>7,3</u> 67	0,5	19	5,8	3

Note. Above the line – extracted carbon from initial raw materials, %; below the line – from Ctot, %.

For a wide implementation of composts to the practice it should be conducted comprehensive qualified agrochemical, toxicological, sanitary research of composts properties from different raw materials and technologies, which regulates their quality in terms of both the most efficient use and environmental safety. There are ten State Standards of Ukraine in the field of organic fertilizers in Ukraine valid – 3; not yet enacted – 7, including ISO 7881 : 2015. Organic fertilizers and organic and mineral fertilizers. Nomenclature of quality parameters. In the field of determination of decorum fertilizers 46 – EN ISO and 18 – DSTU ISO are valid.

Sanitary and hygienic regulations and temporary restrictions that are used to assess agrochemicals safety is complex of 28 scientifically justified limiting indicators of finished product by chemical, radiological and biological factors of hazard.

It is noteworthy that for composts and peats toxicological characterization is not required. The main requirement is not exceed hygienic norms of toxic substances content in a soil and connected environments, as well as in crops; disturbance of structure and function of soil natural microbiocenosis; appearance of pathogenic microorganisms, viable helminth eggs, cysts of pathogenic enteric protozoa, larvae and other dangerous biological agents in a soil and exceeding the allowable content of opportunistic microorganisms. Producers of agrochemicals should know that the differences between the concentration of heavy metals which is necessary for normal plant functioning and the toxic concentration of substances is almost the same. So regarding a number of pollutants, in addition to their total content it should be an information about their available forms.

Obviously, the situation with normative documentation on composts in Ukraine is difficult due to compost is relatively new for our country organic fertilizer, a variety of raw materials and composting technologies, absence of criteria by which it should be evaluated, and methods of identifying unique components of compost, which distinguish it in a class of organic fertilizers.

For a wide implementation of composts to the practice it should be conducted comprehensive qualified agrochemical, toxicological, sanitary research of composts properties from different raw materials and technologies, which regulates their solid heterogeneous organic substrate and includes a thermophilic phase. There are five groups of criteria for assessing the quality of composts: compost maturity, foreign impurities, trace elements, pathogens, organic contaminants. Maturity of compost is an essential feature, if composting product has not reached maturity, the term "compost" should not be used [10]. This explains why a criterion of maturity is included in the definition of "compost". There are various methods for determining of compost maturity but many of them are not perfect. One of the problems when choosing a method for assessing of compost maturity is complexity of results interpretation. Based on the current level of knowledge on this issue, there is no single method that would give an adequate assessment of this criterion.

Concerning chemical composition of compost organic matter content must be at least 30%. Maximum allowable humidity is considered to be 60% (of the total wet weight). The reaction (pH) of compost is not considered to be a standard criterion. The concentration of major nutrients (nitrogen, phosphorus, potassium), paradoxically, is a secondary indicator of quality compost. However, the calculation of doses of organic fertilizers is made in terms of total nitrogen. Water-retaining ability of compost is an important element. Perhaps with time this index will become standard criterion of compost characteristics.

Development of new technologies significantly expands ways of utilization of waste of different origin. Recently fundamentally new technological solution that involves a combination of organic and mineral fertilizers in the new – organic and mineral form is developing. The main task of new form of fertilizers is to combine the positive properties of each component and possibly get rid of the negative. Unlike traditional approaches that prevail in the world, we offer a unified approach to processing organic waste of industrial, municipal and agricultural origin. The basis of elaboration is the conceptual model of humic compounds forming in organic wastes during bioconditioning [3] and conceptual position of complex organic and mineral fertilizers production [1]. The method of calculation of standard expenses of components during production organic and mineral fertilizers, which allows developing and improving the specific recipes of fertilizers for soils and climatic conditions and crops, taking into account the timing and methods of their application.

Conclusions.

Rational application of local sources of raw materials is of vital importance for turnover regulation of matters in farming agriculture and procreation of balance of humus in soils as the basis for stable development of farming agriculture. It is proved that with organic raw the multiple complex arrive in soil of various on chemical composition, level of sustainability and reactivity of organic compounds. That causes significant reclamative potential of organic fertilizers. Diversification and specificity of local sources of raw materials demand theoretical and technological justification, development of normative provision of production and application of fertilizers on their basis.

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