Research Protocol 1K-2021

04/05/2021

LLC "Agroplem"

Chemical research

EcoBelok LLC

Date of receipt of samples: 03/30/2021

Applicant:

EcoBelok LLC

Research date: 01-02.04.2021

Date of printing the protocol: 05.04.2021

**Purpose of the research:** chemical research of the presented samples.

**Samples presented:**

Number Sample description

1. Protein concentrate "Hermetia"
2. Fat "Hermetia"
3. Organic fertilizer Biohumus "Hermetia", old
4. Organic fertilizer Biohumus "Hermetia", fresh

No supporting documentation has been provided.

Research methods:

GOST ISO 6497-2014 Feed. Sample selection.

GOST ISO 6498-2014 Feed, compound feed. Sample preparation for testing.

GOST R 54951-2019 Animal feed. Determination of moisture content.

GOST R 57059-2016 Feed, compound feed, compound feed raw materials. Express method for determining moisture.

GOST 13496.4-2019 Feed, compound feed, compound feed raw materials. Methods for the determination of nitrogen and crude protein content.

GOST 13496.15-2016 Feed, compound feed, compound feed raw materials. Methods for determining the mass fraction of crude fat.

GOST 26226-95 Feed, compound feed, compound feed raw materials. Methods for determination of raw ash.

GOST 31663-2012 Vegetable oils and animal fats. Determination by gas chromatography of the mass fraction of fatty acid methyl esters.

GOST 31665-2012 Vegetable oils and animal fats. Obtaining methyl esters of fatty acids.

GOST R 51487-99 Vegetable oils and animal fats. Methods for determining the peroxide value.

R 4.1.1672-03 Guidelines for quality control and safety of biologically active food additives.

GOST 32195-2013 (ISO 13903: 2005) Feed, compound feed. Method for determination of amino acid content.

Methods for the Analysis of Minor Biologically Active Substances of Food, Moscow 2010.

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**The research results are presented in tables 1-3.**

**Table 1. Chemical studies of the presented samples**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Indicators** | | **Sample 01** | **Sample 03** | | **Sample 04** |
| ***Chemical Research*** | | | | | |
| Crude protein (%) | | 61,7 | - | | - |
| Nitrogen (%) | | - | 2,98 | | 2,64 |
| Moisture (%) | | 3,2 | 40,3 | | 24,4 |
| Crude ash (%) | | 9,9 | 5,7 | | 5,4 |
| Crude fat (%) | | 7,5 | - | | - |
| **Indicators of oxidative deterioration** | **Sample 02** | | |
| Peroxide number (mmol 1 / 2O / kg) | 1,56 | | |

**Table 2. Fatty acid composition of the presented sample**

**Fatty acid profile, % Short name Sample 02**

|  |  |  |
| --- | --- | --- |
| Butyric acid | C4:0 | - |
| Hexanoic acid | C6:0 | - |
| Caprylic acid | C8:0 | - |
| Capric acid | C10:0 | 1,37 |
| Undecanoic acid | C11:0 | - |
| Lauric acid | C12:0 | 49,2 |
| Tridecanoic acid | C13:0 | - |
| Myristic acid | C14:0 | 8,1 |
| Myristoleic acid (cis-9) | C14:1 | 0,24 |
| Pentadecanoic acid | C15:0 | 0,07 |
| Pentadecenoic acid | C15:1 | - |
| Palmitic acid | C16:0 | 9,5 |
| Palmitoleic acid (cis-9) | C16:1 | 2,43 |
| Heptadecenoic acid | C17:1 | - |
| Stearic acid | C18:0 | 1,71 |
| Elaidic acid (trans-9) | C18:1 | - |
| Oleic acid (cis-9) | C18:1 | 14,4 |
| Linoleic acid (cis-9,12) | C18:2 | 10,5 |
| Arachidic acid | C20:0 | - |
| Linolenic acid (cis-6,9,12) | C18:3 | 1,43 |
| Eicosenic acid (cis-11) | C20:1 | - |
| Linolenic acid (cis-9,12,15) | C18:3 | - |
| Heneicosanoic acid | C21:0 | - |
| Eicosadienoic acid (cis-11.14) | C20:2 | - |
| Behenic acid | C22:0 | - |
| Eicosatrienoic acid (cis-8, 11, 14) | C20:3 | - |
| Erucic acid (cis-13) | C22:1 | - |
| Eicosatrienoic acid (cis-11, 14, 17) | C20:3 | - |
| Arachidonic acid (cis-5,8,11,14) | C20:4 | - |
| Tricosanoic acid | C23:0 | - |
| Docosadienoic Acid (cis-13,16) | C22:2 | - |
| Lignoceric acid | C24:0 | - |
| Eicosapentadecanoic acid (cis-5,8,1,14,17) | C20:5 | - |
| Nervonic acid (cis-15) | C24:1 | - |

**The total content of fatty acids, % 98.95**

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**Table 3. Amino acid composition of the presented samples \***

|  |  |  |  |
| --- | --- | --- | --- |
| **Indicators** | **Sample 01** | **Sample 03** | **Sample 04** |

**Amino acid content**

|  |  |  |  |
| --- | --- | --- | --- |
| Alanine (%) | 3,9 | 0,04 | 0,01 |
| Arginine (%) | 2,13 | 0,04 | 0,04 |
| Aspartic acid (%) | 6,2 | 0,05 | 0,04 |
| Valine (%) | 3,03 | 0,04 | 0,01 |
| Histidine (%) | 1,75 | 0,02 | 0,02 |
| Glycine (%) | 3,12 | 0,01 | 0,01 |
| Glutamic acid (%) | 8,3 | 0,08 | 0,07 |
| Isoleucine (%) | 1,9 | 0,01 | 0,01 |
| Leucine (%) | 4,03 | 0,08 | 0,06 |
| Lysine (%) | 3,1 | 0,09 | 0,07 |
| Methionine (%) | 0,82 | 0,07 | 0,05 |
| Proline (%) | 3,38 | 1,1 | 1,1 |
| Serine (%) | 2,7 | 0,04 | 0,04 |
| Tyrosine (%) | 3,9 | 0,02 | 0,03 |
| Threonine (%) | 2,37 | 0,04 | 0,05 |
| Tryptophan (%) | 0,41 | - | - |
| Phenylalanyl (%) | 2,4 | - | - |
| Cystine (%) | 0,92 | 0,04 | 0,02 |

\* - during the analysis, a standard mixture of amino acids was used (amino acids standard 1 nmol / μL in 0.1M HCl, item 5061-3330, lot No: BCCC6311, expires 13-Dec 2021), Agilent Technologies.

**Date of drawing up the test report: 04/05/2021**

**Head of ILC: Cherkashin A.V.**

**Leading analytical chemist: Alekseeva T.G.**

Test results refer to specific samples only.

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