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SWEDEN

Title :	**Analytical Report for Order 12235715**
Test report number :	**AR-22-FR-040914-01**
Project name :	**ba-se-27-2-3**
Number of samples :	**1**
Sample type:	**biochar**
Sample Taker:	**delivered by client**
Sample reception date :	**2022-09-14**
Sample processing time :	**2022-09-14 - 2022-10-06**

The test results refer solely to the analysed test specimen. Unless the sampling was done by our laboratory or in our sub-order the responsibility for the correctness of the sampling is disclaimed. This analytical report is only valid with signature and may only be further published completely and unchanged. Extracts or changes require the authorisation of the EUROFINS UMWELT in each individual case.

Our General Terms & Conditions of Sale (GTCS) are applicable, as far as no specific agreements do exist. The GTCS are available on http://www.eurofins.de/umwelt/avb.aspx.

Accredited test laboratory according to DIN EN ISO/IEC 17025:2018 DAkkS notification under the DAkkS German Accreditation System for Testing. The laboratory is according (D-PL-14081-01-00) accredited.

Attachments
XML_Export_AR-22-FR-040914-01.xml

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Digitally signed 10/6/2022
Annett Rietschel
Prüfleitung

DAkkS Deutsche Akkreditierungsstelle D-PL-14081-01-00

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Biochar properties														
Bulk density < 3 mm	FR		based on VDLUFA-Methode A 13.2.1								kg/m³	-	-	257
specific surface (BET)	SND2/o		DIN ISO 9277: 2014								m²/g	-	-	132.79
water holding capacity (WHC) < 2 mm	FR		DIN EN ISO 14238, A: 2014-03								%	-	-	278.7
Moisture	FR	F5	DIN 51718: 2002-06							0.1	% (w/w)	-	24.6	-
Ash content (550°C)	FR	F5	DIN 51719: 1997-07							0.1	% (w/w)	-	14.1	18.7
Total carbon	FR	F5	DIN 51732: 2014-07							0.2	% (w/w)	-	56.1	74.4
carbon (organic)	FR		Calculation								% (w/w)	-	56.0	74.3
Hydrogen	FR	F5	DIN 51732: 2014-07							0.1	% (w/w)	-	1.5	2.0
Total nitrogen	FR	F5	DIN 51732: 2014-07							0.05	% (w/w)	-	1.87	2.48
Sulphur (S), total	FR	F5	DIN 51724-3: 2012-07							0.03	% (w/w)	-	0.07	0.09
Oxygen	FR	F5	DIN 51733: 2016-04								% (w/w)	-	2.3	3.0
Total inorganic carbon (TIC)	FR	F5	DIN 51726: 2004-06							0.1	% (w/w)	-	0.1	0.1
carbonate-CO2	FR	F5	DIN 51726: 2004-06							0.4	% (w/w)	-	< 0.4	0.5
H/C ratio (molar)	FR		Calculation									-	0.31	0.32
H/Corg ratio (molar)	FR		Calculation	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7	< 0.7			-	0.31	0.32
O/C ratio (molar)	FR		Calculation									-	0.031	0.030
pH in CaCl2	FR		DIN ISO 10390: 2005-12									-	10.4	-
salt content	FR		BGK III. C2: 2006-09							0.005	g/kg	-	10.8	-
salt content	FR		BGK III. C2: 2006-09							0.005	g/l	-	2.79	-
Conductivity at 1,2 t pressure	FR		Internal Method SAA-H-Lf-Pflanzen-kohle.040							0.01	mS/cm	-	-	7.6
Conductivity at 2 t pressure	FR		Internal Method SAA-H-Lf-Pflanzen-kohle.040							0.01	mS/cm	-	-	11

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Consumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Conductivity at 3 t pressure	FR		Internal Method SAA-H-Lf-Pflanzen-kohle.040							0.01	mS/cm	-	-	14
Conductivity at 4 t pressure	FR		Internal Method SAA-H-Lf-Pflanzen-kohle.040							0.01	mS/cm	-	-	16
Conductivity at 5 t pressure	FR		Internal Method SAA-H-Lf-Pflanzen-kohle.040							0.01	mS/cm	-	-	17
Protein, crude	FR	F5	VDLUFA Methodenbuch Band III: 2014-09								% (w/w) dm	not determined	-	-
Fat, crude	FR	F5	VDLUFA Methodenbuch Band III: 2014-09								% (w/w) dm	not determined	-	-
Crude fibre	FR	F5	VDLUFA Methodenbuch Band III: 2014-09								% (w/w) dm	not determined	-	-
Crude ash	FR	F5	DIN 51719: 1997-07							0.1	% (w/w)	-	14.1	18.7
HCl-unsoluble ash	ES005 A/o		VDLUFA III 8.2								Ma.-% Raw Product	7.7	-	-
Fluor total (F)	ES005 A/o	WV	VDLUFA III, 17.3.2: 2006	150							mg/kg 88% DM	19	-	-
Polychlorinated dibenzodioxins/-furans (17 PCDD/F) by GC-HRMS														
2,3,7,8-TetraCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,7,8-PentaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.15	-	-
1,2,3,4,7,8-HexaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.15	-	-
1,2,3,6,7,8-HexaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.15	-	-
1,2,3,7,8,9-HexaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.15	-	-
1,2,3,4,6,7,8-HeptaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.15	-	-
OctaCDD	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	0.4	-	-
2,3,7,8-TetraCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.05	-	-

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
1,2,3,7,8-PentaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
2,3,4,7,8-PentaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,4,7,8-HexaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,6,7,8-HexaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,7,8,9-HexaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
2,3,4,6,7,8-HexaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,4,6,7,8-HeptaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
1,2,3,4,7,8,9-HeptaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.1	-	-
OctaCDF	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	< 0.2	-	-
WHO(2005)-PCDD/F TEQ (lower-bound)	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	0.00012	-	-
WHO(2005)-PCDD/F TEQ (upper-bound)	ES005 A/o		DIN 38414-S24: 2000-10								ng/kg dw	0.377	-	-
WHO(2005)-PCDD/F TEQ (upper-bound)	ES005 A/o		calculated	0.75							ng/kg 88% DM	0.331	-	-

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Polychlorinated biphenyl (12 WHO PCB) by GC-HRMS														
PCB 77	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	1	-	-
PCB 81	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 0.2	-	-
PCB 105	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	6.5	-	-
PCB 118	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	15	-	-
PCB 114	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 2	-	-
PCB 123	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 2	-	-
PCB 126	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 0.2	-	-
PCB 156	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	3.3	-	-
PCB 157	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 2	-	-
PCB 167	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 2	-	-
PCB 169	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 0.3	-	-
PCB 189	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	< 3	-	-
WHO(2005)-PCB TEQ (lower-bound)	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	0.00085	-	-
WHO(2005)-PCB TEQ (upper-bound)	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	0.0302	-	-
WHO(2005)-PCB TEQ (upper-bound)	ES005 A/o		calculated								ng/kg 88% DM	0.0266	-	-
WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	ES005 A/o		DIN 38407-F3: 1998-07								ng/kg dw	0.407	-	-
WHO(2005)-PCDD/F+PCB TEQ (upper-bound)	ES005 A/o		calculated	1.25							ng/kg 88% DM	0.358	-	-

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Polychlorinated biphenyl (7 PCB) by GC-HRMS														
Total 6 Indicator PCB (incl. LOQ)	ES005 A/o		DIN 38414-S20: 1996-01	10							µg/kg 88% DM	0.24	-	-
PCB 28	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	0.097	-	-
PCB 52	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	0.059	-	-
PCB 101	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	0.028	-	-
PCB 153	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	0.028	-	-
PCB 138	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	0.024	-	-
PCB 180	ES005 A/o		DIN 38414-S20: 1996-01								µg/kg 88% DM	< 0.020	-	-

										Description		**sp-se-27-2-3-2**		
				Limit values						**Sample number**		**122131862**		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Elements from the micro wave pressure digestion acc. to DIN 22022-1: 2014-07														
Arsenic (As)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		13	13	13	13		0.8	mg/kg	-	-	< 0.8
Lead (Pb)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		45	120	120	120		2	mg/kg	-	-	< 2
Cadmium (Cd)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01		0.7	1.5	1.5	1.5		0.2	mg/kg	-	-	< 0.2
Copper (Cu)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	70	70	100	100	100		1	mg/kg	-	-	18
Nickel (Ni)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	25	25	50	50	50		1	mg/kg	-	-	< 1
Mercury (Hg)	FR	F5	DIN 22022-4: 2001-02		0.4	1	1	1		0.07	mg/kg	-	-	< 0.07
Zinc (Zn)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	200	200	400	400	400		1	mg/kg	-	-	153
Chromium (Cr)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01	70	70	90	90	90		1	mg/kg	-	-	4
Boron (B)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							1	mg/kg	-	-	16
Manganese (Mn)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							1	mg/kg	-	-	232
Silver (Ag)	FR	F5	DIN EN ISO 17294-2 (E29): 2017-01							5	mg/kg	-	-	< 5
Elements from the pressure digestion acc. to DIN EN 13805: 2014-12														
Arsenic (As)	ES005 A/o	WV	DIN EN ISO 17294-2 (E29): 2017-01	2							mg/kg 88% DM	0.13	-	-
Lead (Pb)	ES005 A/o	WV	DIN EN ISO 17294-2 (E29): 2017-01	10							mg/kg 88% DM	0.88	-	-
Cadmium (Cd)	ES005 A/o	WV	DIN EN ISO 17294-2 (E29): 2017-01	0.8							mg/kg 88% DM	0.026	-	-
Mercury (Hg)	ES005 A/o	WV	DIN EN 15763:2010-04	0.1							mg/kg 88% DM	< 0.0020	-	-

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Elements fr. the borate digestion of ash 550 °C acc. to DIN 51729-11:1998-11(AR)														
Calcium as CaO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	7.9
Iron as Fe2O3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	0.8
Potassium as K2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	17.4
Magnesium as MgO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	4.0
Sodium as Na2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	0.6
Phosphorus as P2O5	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	13.0
sulphur as SO3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	0.7
Silicon as SiO2	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	% (w/w)	-	-	51.8
Macronutrients														
Total nitrogen	FR	F5	DIN 51732: 2014-07							0.5	g/kg	-	18.7	24.8
Macronutrients-LiBO2/Li2B4O7/LiBr-melt of ash 550°C [DIN 51729-11:1998-11] (OS)														
Phosphorus as P2O5	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	24.2
Potassium as K2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	32.5
Calcium as CaO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	14.8
Magnesium as MgO	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	7.5
Sodium as Na2O	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	1.2
sulphur as SO3	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	1.3
Elements fr. the borate digestion of ash 550°C acc. to DIN 51729-11:1998-11(OS)														
Iron (Fe)	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	1.1
Silicon (Si)	FR	F5	DIN EN ISO 11885 (E22): 2009-09							0.1	g/kg	-	-	45.2

										Description		sp-se-27-2-3-2		
				Limit values						Sample number		122131862		
Parameter	**Lab**	**Accr.**	**Method**	EBC-Feed	EBC-Agro Organic	EBC-Agro	EBC-Urban	EBC-Con-sumer Materials	EBC-Basic Materials	**LOQ**	**Unit**		**ar**	**db**
Organic contaminents from toluene extraction acc. to EN 16181:2019-08 (method 2)														
Naphthalene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	0.9
Acenaphthylene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	0.2
Acenaphthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Fluorene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Phenanthrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	0.4
Anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	0.4
Pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	0.4
Benz(a)anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Chrysene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Benzo(b)fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Benzo(k)fluoranthene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Benzo(a)pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Indeno(1,2,3-cd)pyrene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Dibenz(a,h)anthracene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Benzo(g,h,i)perylene	FR	F5	DIN EN 16181:2019-08							0.1	mg/kg	-	-	< 0.1
Total 8 EFSA-PAH excl. LOQ	FR	F5	DIN EN 16181:2019-08	1	1	1	1	1	4		mg/kg	-	-	(n. c.) [1)]
Total 16 EPA-PAH excl. LOQ	FR	F5	DIN EN 16181:2019-08		4 [2)]	6 [2)]					mg/kg	-	-	2.3
Benzo(e)pyrene	FR	F5	DIN EN 16181:2019-08	< 1	< 1	< 1	< 1	< 1	< 1	0.1	mg/kg	-	-	< 0.1
Benzo-(j)-fluoranthen	FR	F5	DIN EN 16181:2019-08	< 1	< 1	< 1	< 1	< 1	< 1	0.1	mg/kg	-	-	< 0.1

Explanations

LOQ - Limit of quantification

ar - as received

db - dry basis

Lab - Abbreviation of the performing laboratory

Accr. - Abbreviation of the accreditation of the performing laboratory

Comments for results

[1)] not calculable

not determined -

These methods apply for animal feed conventional type. The methods are not validated for the matrix biochar and can lead to implausible results.

"Crude protein, crude fiber and crude fat are completely decomposed in the course of complete pyrolysis and are therefore no longer present in biochar. A biochar is considered to be completely pyrolyzed if the H / Corg ratio is < 0.7, which is the prerequisite for EBC certification. Thus, the analysis of crude protein, crude fiber and crude fat is not required and set by definition as 0 g kg-1." [1]

[1] EBC (2012-2022) 'European Biochar Certificate - Guidelines for a Sustainable Production of Biochar.' European Biochar Foundation (EBC), Arbaz, Switzerland. (http://european-biochar.org). Version 10.1E from 10th Jan 2022

The parameters identified by ES005A have been performed by the laboratory SGS Analytics Germany GmbH (Jena) (Orlaweg 2, Jena). The accreditation code WV identifies the parameters accredited according to DIN EN ISO/IEC 17025:2018 DAkkS D-PL-14004-10-00 .

The parameters identified by FR have been performed by the laboratory Eurofins Umwelt Ost GmbH (Lindenstraße 11, Gewerbegebiet Freiberg Ost, Bobritzsch-Hilbersdorf). The accreditation code F5 identifies the parameters accredited according to DIN EN ISO/IEC 17025:2018 DAkkS D-PL-14081-01-00 .

The parameters identified by SND2 have been performed by the laboratory Ruhr Lab GmbH (Glückaufstraße 56, Gelsenkirchen).

/o - The analysis has been outsourced.

Explanations regarding Limits

Analysis performed according to guidelines for the sustainable production of biochar - EBC, Version 10.1E - of 10/01/2022.

Ho,V / Hu,p: complies calorific value at constant volume or pressure

AR: related to ash
OS: related to original substance

[2)] The very low PAH limit values only allow an analytical accuracy of 50% for the limit value: "sum 16 EPA-PAH" of 4 mg/kg and of 40% for the limit value of 6 mg/kg which implies an accuracy of ± 2 mg/kg db and ± 2.4 mg/kg db, respectively.

The presentation of comparative values in the analytical report is a service provided by EUROFINS UMWELT. The cited comparative values (limit, guideline or other allocation values) are partially simplified and do not take into account all comments, ancillary provisions and/or exemptions of the corresponding regulations.