Field study on processing factors for selected pesticides by crushing of oilseeds for application as animal feed

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Summary

In this field study three oilseeds (soybean, rapeseed and sunflower seeds) were grown and treated on the field with a pesticide mix containing 8 pesticides. The oilseeds were cultivated under conditions comparable to common practice and following the requirements of OECD 509 (Crop field trial[1]) as much as possible. Pesticides were applied in an exaggerated manner, as required by OECD Test No. 508 (Magnitude of the Pesticide Residues in Processed Commodities[2]). After harvest the oilseeds were processed into different fractions, similar to the common processing of these products in practice. For soybean these fractions included beans, hulls, dehulled beans, flakes, white flakes, meal, toasted meal, extracted oil, degummed oil, degummed watery phase, degummed bleached oil, degummed bleached deodorized oil and degummed bleached deodorized fatty acid distillate. For rapeseed and sunflower these fractions included: seeds, flakes, cooked material, press cake, white flakes, meal, toasted meal, pressed oil, extracted oil, crude oil (a mix of extracted and pressed oil), degummed oil, degummed watery phase, degummed bleached, degummed bleached deodorized and degummed bleached deodorized fatty acid distillate, caustic washed oil, caustic washed bleached oil, caustic washed bleached deodorized oil and caustic washed bleached deodorized distillate. Subsequently, samples of all fractions were analyzed for pesticides using a LC-MS/MS method and Processing factors (Pf) were calculated as follows:

Pf = residue concentration in processed product / residue concentration in the Raw Material.

Assessments were made and conclusions were drawn on the validity of the field trial design, the practicability of the processing procedures, the sample quality, the analytical performance, the achievement of sufficiently high residue levels, and the applicability of the processing factors.

The following conclusions can be drawn from the study:

1. *Field trial design*: the current field study design facilitated very efficient determination of residues and processing factors for 8 pesticides in processed soybean, rapeseed and sunflower seed products;
2. *Processing of oilseeds*: Partners from industry agreed, that the overall processing scheme from Section 2.4 sufficiently represents the processing conditions in the industry. The fractions mimic possible animal feed products in practice and can be used as such in the establishment of processing factors for pesticides;
3. *Fat and moisture analysis*: the present results on oil and moisture analysis of processed oilseed products are in line with what can be expected in industrial practice;
4. *Homogeneity*: since the pre-set criteria were met, all pesticides were considered homogenously distributed over the oilseed batches;
5. *Pesticide content*: the obtained pesticide concentrations in the oilseeds were sufficiently high for the purpose of this study (i.e. pesticide analyses and processing factor calculation), with the exception of metalaxyl for processed products of soybeans and sunflower seeds;
6. *Pesticide content:* although the three crops received a similar spraying regimen in the field, some differences in average pesticide concentration between the three oilseeds were seen. Either or not including a dehulling step in the process, is most probably an important factor in explaining these observed differences;
7. *Pesticide content*: The recovery of the pesticides differed for some pesticides among the specific oilseeds;
8. *Pesticide distribution*: predictions of the fate of pesticides in processed oilseed products based on LogKow values, solely by comparing downstream pesticide concentrations, is most probably not reliable;
9. *Processing factors*: overall, the Processing Factors determined in this field study are considered reliable and fit for the intended use;

[1] https://read.oecd-ilibrary.org/environment/test-no-509-crop-field-trial_9789264076457-en#page1

[2] https://read.oecd-ilibrary.org/environment/test-no-508-magnitude-of-the-pesticide-residues-in-processed-commodities_9789264067622-en#page1

10. *Processing factors*: the trend in Processing Factors for pesticides as a function of LogKow for the same processed fraction (e.g., meal, crude oil, aqueous extract or refined oil) is not always comparable among the three oilseeds;
11. *Processing factors*: this study shows that the Processing Factors calculated from this field study for different processed oilseed products can be used without difficulty as input for the applied use, as described in the Information note on Article 20 of Regulation (EC) No 396/2005 as regards processing factors and composite food and feed.

1 Introduction

1.1 Motivation

When plant protection products, also named pesticides, are used to protect plants and plant derived products against pests (e.g. insects, rodents, fungi, bacteria etc.), residues from these chemicals may be left on and/or in the plants. Within the European Union, maximum residue limits (MRLs) have been set for the presence of these residues. Regulation (EC) No 396/2005 lays down these MRLs for pesticides in/on food and feed of plant origin. The MRLs apply to specific parts of the products, and are given per product type. In principle, the MRLs as set in this Regulation are also applicable to processed and composite products (see Article 20 of Regulation (EC) No 396/2005), but changes in the levels of pesticide residues caused by processing and/or mixing should be taken into account by applying 'processing factors'. The processing factor is calculated as the ratio between the pesticide level in the processed products and that in the raw material. Applying a processing factor is permitted by law but since Annex VI of Reg. (EU) Nr. 396/2005 has not been filled, processing factors are not established to date. The PPP AF-18029 'Verwerkingsfactoren voor pesticiden in diervoeding' investigates the distribution of pesticides over processed products to achieve processing factors useable for risk assessment and enforcement.

1.2 Demarcation

A field study was done with soybeans, sunflower seeds and rapeseeds.

Pesticides included were acetamiprid, pirimicarb, metalaxyl, prothioconazole-desthio, tebuconazole, pirimiphos-methyl, deltamethrin and cypermethrin.

1.3 Purpose of the field study

The aim of this study is to investigate the effect of the processing of oilseeds into products for use in animal feed on the concentration of pesticide residues in such products, so as to be able to derive processing factors from that. For this purpose, a study was designed to mimic the OECD Test No. 508 (Magnitude of the Pesticide Residues in Processed Commodities) and OECD 509 (Crop field trial) as much as possible. An agronomical growing phase with 3 oilseeds, including two exaggerated treatments of the crops with a cocktail of pesticides, was followed by extensive processing of the raw materials according to currently used industrial practice. This field study is to confirm and add to the results of a spiking study in which intact oilseeds were sprayed and mixed with a cocktail of pesticides at pilot-scale (ca. 100 kg batches). In both studies the processing was done at pilot scale, under similar conditions and in the same facilities.

2 Materials & Methods

2.1 Time schedule of field study

In Table 1, the time schedule of the field study for oilseeds is described.

Table 1 *Time schedule field study.*

Activity	Date
Field study (agronomic part) at Wageningen Plant Research	May-October 2021
Sample transfer WPR-WFSR	25 October 2021
Sample transfer WPR-ITERG	4 November 2021
Sample transfer ITERG -WFSR	13 December 2021
Sample transfer ITERG -ADM	13 December 2021
Sample transfer ADM-WFSR	10 January 2022
Pesticides analyses	February - March 2022
Fat and moisture analyses	February 2022
Reporting of draft report	June 2022
Reporting of final report	December 2023

2.2 Field study (agronomic part)

2.2.1 Origin of the oil seeds

The following varieties for the oilseeds were used in the field trial:
- Rapeseed: DK Exception
- Soya bean: Ambella
- Sunflower seed: Perdovick

2.2.2 Sowing, pesticide treatment and harvest of the oilseeds

The timing of the agronomic part is given in Figure 1.

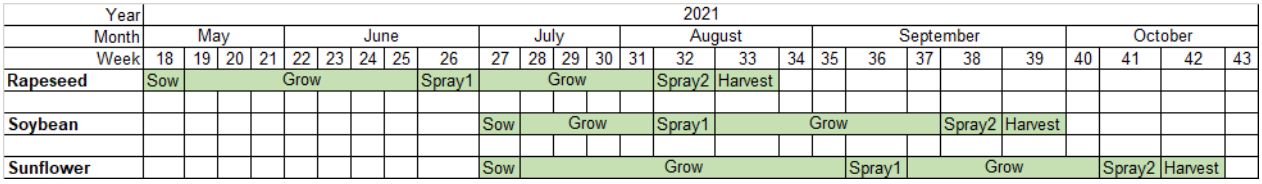


Figure 1 *Time schedule of the agronomic part of the field study: sowing, spraying and harvest.*

Rapeseed, soybeans, and sunflowers were grown on adjacent 9 m x 110 m plots (0.1 ha each) located at the facilities of WPR at the Edelhertweg 1 in Lelystad, the Netherlands. Before and during the growth period, the soil was prepared and fertilized with nitrogen, phosphorus, potassium and magnesium. The sowing and fertilization regimen is given in Table 2.

Table 2 *Sowing and fertilization of soybeans, rapeseed and sunflowers.*

Oilseed	Fertilization	Row distance	Seeds per Ha	Planting depth
Rapeseed	300 kg potassium K-60/ha 400 kg KAS/ha	25 cm	5 kg	2 cm
Soybean	300 kg potassium K-60/ha	25 cm	150 kg; 600,000	4 cm
Sunflower	150-200 kg potassium K-60/ha 400 kg K-60/ha 200 kg kieserite/ha	50-75 cm	60,000	5 cm

The BBCH-scale was used to identify the phenological development stages of the plants. The BBCH-scale ranges from code 00 (seed treatment before planting) to code 99 (post-harvest or storage treatment). Table 3 shows the agronomic development of the crops. During the growth period, the crops were sprayed twice with the pesticide cocktail from Tables 4 and 6. The timing of spraying was based on the growth phase (BBCH-scale) of the crop. After the growth period, the seeds were harvested and air-dried to a moisture percentage of 12,76%, 5,89% and 7,86% for respectively soybean, rapeseed and sunflower seed.

Table 3 *Agronomic development.*

BBCH-scale	Date	Oilseed	Agronomical stage	Picture
10	12 May 2021	Rapeseed	Growing	
10	14 June 2021	Soybean	Growing	
12	14 June 2021	Sunflower	Growing	
69	29 June 2021	Rapeseed	1st pesticide treatment	
69	11 August 2021	Soybean	1st pesticide treatment	
69	8 September 2021	Sunflower	1st pesticide treatment	
85	11 August 2021	Rapeseed	2nd pesticide treatment	
85	23 September 2021	Soybean	2nd pesticide treatment	
88	12 October 2021	Sunflower	2nd pesticide treatment	
89	16 August 2021	Rapeseed	Harvest	
89	27 September 2021	Soybean	Harvest	
89	13 October 2021	Sunflower	Harvest	
99	18 October 2021	Rapeseed Soybean Sunflower	Drying*	

* The three crops were dried at ambient temperature, under aeration for 5 days, to a moisture content of 5.89% (rapeseed), 7.86% (sunflower seed) or 12.76% (soybeans).

The pesticides in the cocktail were selected to represent different mechanisms of action and different LogKow (ranging from 0.8 to 5.6; see Table 4).

Table 4 *Selected pesticides for spiking oil seeds in the field study.*

Pesticides	Type of pesticide	LogKow	Source/Ref.
Acetamiprid	Insecticide	0.8	PPDB*
Pirimicarb	Insecticide	1.7	PPDB
Metalaxyl	Fungicide	1.75	EUPD**
Prothioconazole-desthio	Metabolite of fungicide	3.04	PPDB
Tebuconazole	Fungicide	3.7	PPDB
Pirimiphos-methyl	Insecticide	4.2	PPDB
Deltamethrin	Insecticide	4.6	EUPD
Cypermethrin	Insecticide	5.3-5.6	EUPD

* PPDB: Pesticide Properties Data Base; **EUPD: European Union Pesticide Database.

This study was conducted in the spirit of the OECD 508 Guideline on the testing of chemicals "Magnitude of the Pesticide Residues in Processed Commodities' and OECD 509 "Crop field trial". The field trial described in this study addresses the requirements of OECD 508/509 as much as possible, although full compliance with OECD 508/509 cannot be claimed for this study. Table 5 shows the comparison of OECD 508/509 with the current field study design.

Table 5 *OECD 508/509 versus WUR field study.*

	Requirements OECD 508/509	WUR Field Study
Study conducted under GLP?	Yes	No
Number of pesticides per field study	1	8
Number of crops per field study	1	3
Number of field studies per pesticide	2 tot 4	1
Number of independent field test sites	2	1
Potential use of PF	Domestic/Industrial	Industrial
Types of oil production: cold pressed/solvent extracted	Separate trials	Mixed trial
Exaggerated application of pesticide (up to 5x)	Yes	Yes (up to 10 x)
Phytotoxicity after application of pesticide?	No	No
Quantifiable residual levels in the RAC	1 mg/kg or 10x LOQ	0.0 - 3.7 mg/kg
Soybean	0.1 mg/kg or 10x LOQ	0.0 - 1.58 mg/kg
Rapeseed	0.1 mg/kg or 10x LOQ	0.01 -3.68 mg/kg
Sunflower seed	0.1 mg/kg or 10x LOQ	0.01 -3.70 mg/kg
Number of replicate samples	duplo	duplo
Weight of the RAC known before processing?	Yes	Yes
Mimicing industrial practice?	Yes	Yes
Process described in flowchart/SOP?	Yes	Yes
Validated analytical method described?	Yes	Yes
Storage stability data available?	Yes	No
Report conform specified elements?	Yes	Most

Table 6 gives the rationale for the selected exaggerated concentrations of the pesticides, as required for field studies in OECD 508.

Table 6 *Exaggerated concentration of pesticides for pesticide mix application in the field study.*

	MRL (mg/kg)							
Crops	**Rape seed**	**Sunflower seed**	**Soy beans**	**Normal application rate**	**1x Normal application estimated amount AI* on seed**	**5x Normal application estimated amount AI on seed**	**Intended amount on seed (MRL or MRL truncated at 0.5)**	**Selected exaggerated treatment (x normal application)**
Pesticides				**kg/ha or L/ha**	**mg/kg**	**mg/kg**	**mg/kg**	***
Imidacloprid**								
Acetamiprid	0.4	0.01	0.01	0.2	0.13	0.67	0.4	**5x**
Mepiquat	15	40	0.05	1.4	1.40	7.00	0.5	**5x**
Metalaxyl	0.02	0.02	0.02	0.03	0.00	0.01	0.02	**10x**
Pirimicarb	0.05	0.1	0.02	0.25	0.42	2.08	0.05	**5x**
Tebuconazole	0.5	0.02	0.15	1.0	1.43	7.17	0.5	**5x**
Pirimiphos-methyl	0.05	0.5	0.5	0.25	0.42	2.08	0.5	**5x**
Deltamethrin	0.2	0.05	0.02	0.84	0.07	0.35	0.2	**5x**
Cypermethrin	0.2	0.2	0.05	0.1	0.08	0.42	0.2	**5x**

* AI = Active Ingredient.

** Imidacloprid was omitted from the selection, because it was no longer legally allowed and no longer commercially available (Study plan amendment, May 2021).

*** Estimated % area occupied by seed: 1%; Estimated seed yield: 150 kg.

Sampling procedure

The harvest yielded > 100 kg of each dried oilseed. From each batch of oilseeds from the field study 10 samples were collected using a grain/seed sampling drill (Figure 2) as described on the sampling list (Annex 1). Only the bottom sampling hole was used to collect 5 samples from different locations at the top of the container and 5 samples from different locations at the bottom of the container for homogeneity analysis. Each sample was approx. 100 g and the samples were collected in 10 uniquely labeled polyethylene sample jars with screwcaps. The samples were stored in a freezer at WFSR until analysis.

Figure 2 *Typical sampling drill.*

Harvested seeds/beans were collected in plastic containers with crew-on lids. The three 100 kg batches of oilseeds were send to ITERG in Canéjan, France for processing. After processing at ITERG samples of the raw materials and all processed fractions were sent to WFSR for analysis. The extracted oil of each oilseed (2 containers of 2.5 kg each for each oilseed) was sent by ITERG to ADM in Hamburg, Germany for further refining of the oils. During the transport from ITERG to ADM, some oil samples unfortunately leaked and some material was lost. ADM was able to process the samples as agreed, but unfortunately the amount was not sufficient for moisture analysis. The pesticide analysis could be performed for all fractions as scheduled.

The processing at ITERG and ADM is described in Figures 3A and 3B, Annex 4 (ITERG) and Annex 5 (ADM). A dehulling step was only included for soybeans. In practice, sunflower seeds are sometimes dehulled as well, but it was agreed with the consortium to omit such a dehulling step for sunflower seeds in this study.

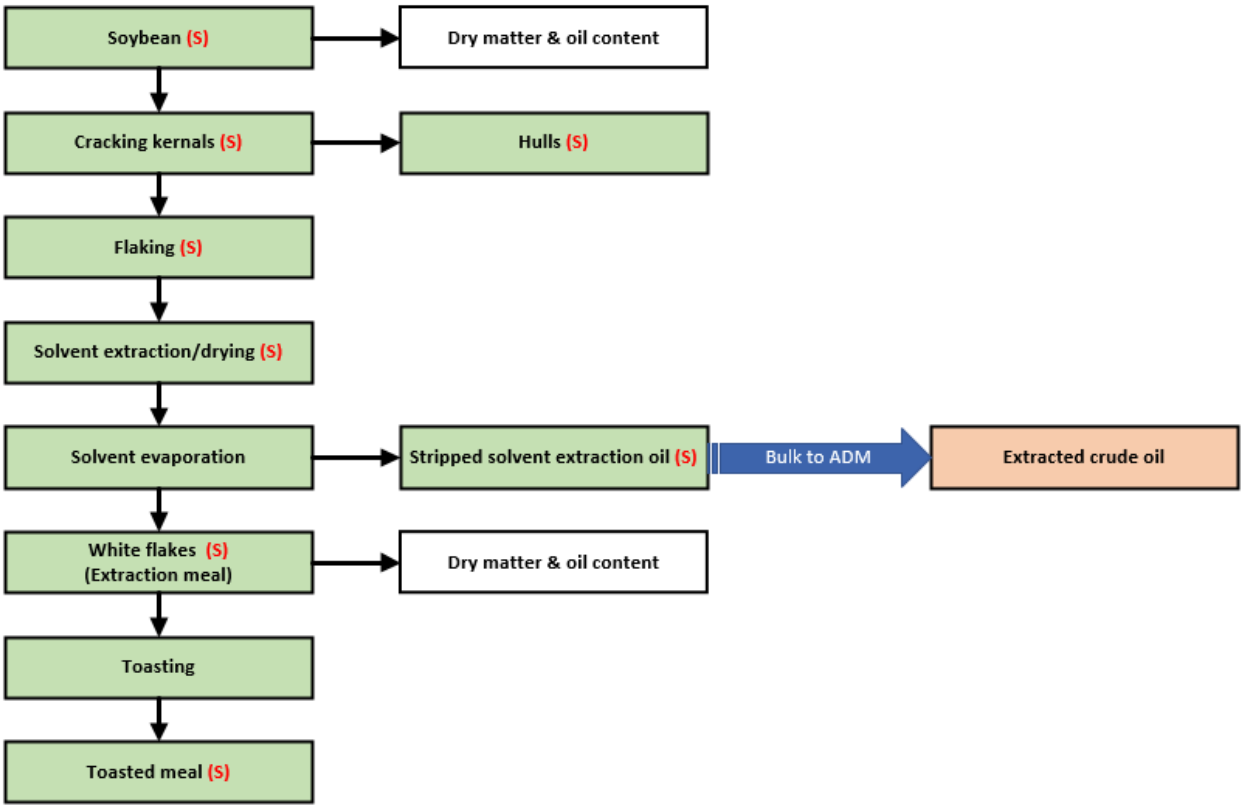
After processing, the samples were sent to Wageningen Food Safety Research according to the sampling lists given in Annex 2 and Annex 3.

Until analysis, the samples were stored in a freezer (<-18 °C). Before the analysis, the samples were milled when necessary with a Grindomix GM 200.

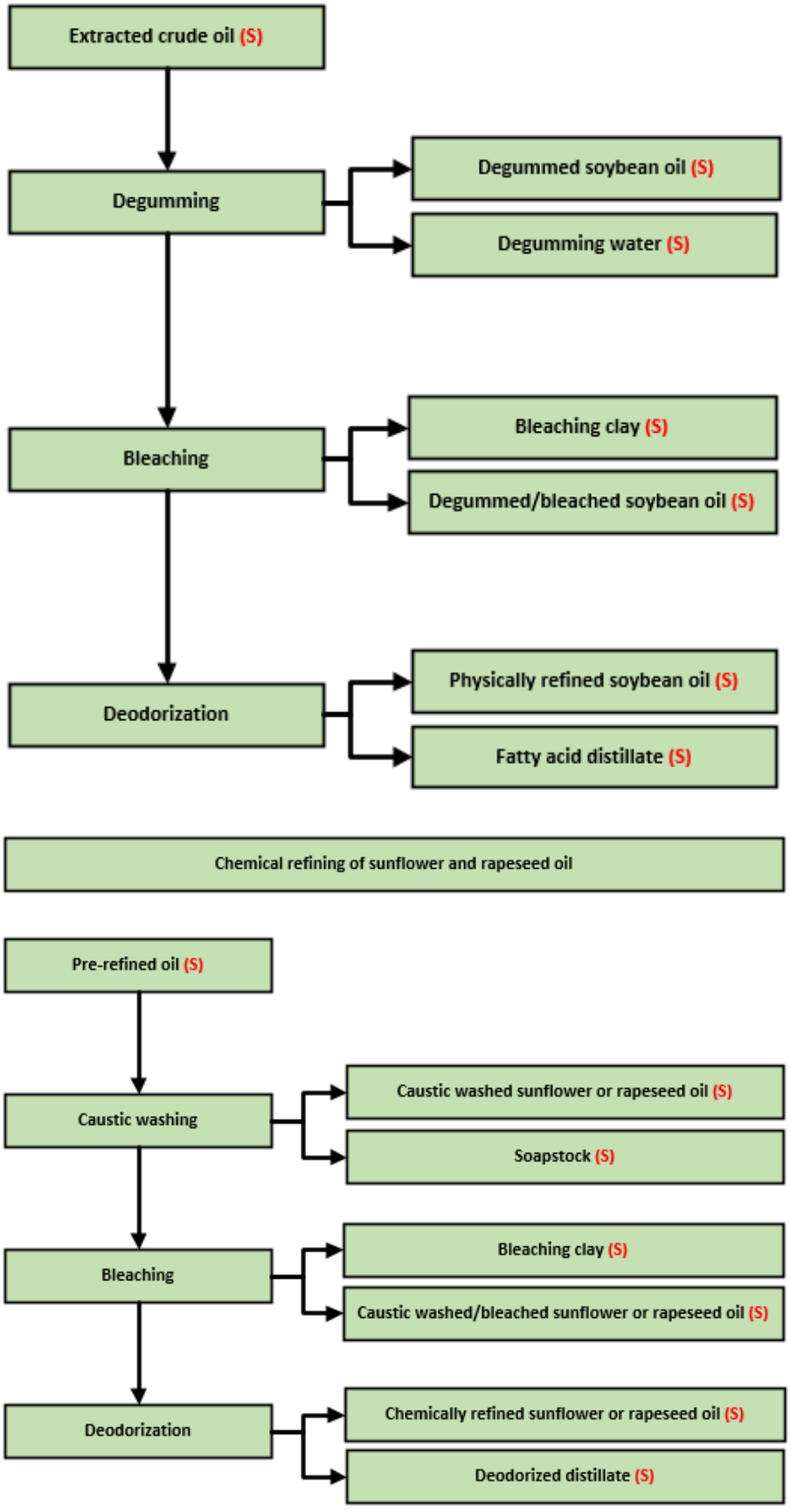
The remaining oil seed sample materials were stored at <-18 °C in suitable sealed bins at WFSR. After an undefined storage period (approx. 3-24 months; to be determined), the treated oil seed sample materials will be disposed of as chemical waste, after approval by the project manager.

2.3 Processing of oilseeds

Figure 3A *Schematic process of soybean crushing*
Part 1*: Soybean crushing at ITERG, France.*



***Part 2**: Physical refining of soybean oil at ADM, Germany.*



2.4 Analyses

After sampling, the samples were transported from WPR, ITERG or ADM (based on the part of processing) to WFSR on the WUR campus in Wageningen. The samples were registered, stored in a freezer and processed for analysis by WFSR sample management (Table 7, part 1-3).

Pesticide analysis
The pesticides were analyzed quantitatively according to WFSR SOP A-1155.

For analysis a LC-MS/MS method was used. The performance of the method and the recovery rates of each of the pesticides were tested for both matrices. The selected pesticides were analyzed and reported according to the residue definition for the relevant matrices, as described in Regulation (EC) No 396/2005.

Table 7 *Number of samples for pesticide analysis in the field study.*
Part 1: *ITERG samples for WFSR.*

ITERG sample code	Sample name	Weight (kg)	WUR sample code 1	WUR sample code 2	WUR sample code 3
10-TO	Spiked sunflower seeds	3 * 300g	ZC-FT-46	ZC-FT-47	ZC-FT-48
20-TO	Sunflower flakes	3 * 300g	ZF-FT-49	ZF-FT-50	ZF-FT-51
30-TO	Cooked sunflower flakes	3 * 300g	ZCM-FT-52	ZCM-FT-53	ZCM-FT-54
40-TO	Sunflower press-cake	3 * 300g	ZPC-FT-55	ZPC-FT-56	ZPC-FT-57
50-TO	Sunflower pressed oil	3 * 300g	ZOP-FT-67	ZOP-FT-68	ZOP-FT-69
60-TO	Sunflower white flakes (extraction meal)	3 * 300g	ZWF-FT-58	ZWF-FT-59	ZWF-FT-60
70-TO	Sunflower extraction oil	3 * 300g	ZOE-FT-64	ZOE-FT-65	ZOE-FT-66
80-TO	Sunflower toasted extraction meal	3 * 300g	ZTM-FT-61	ZTM-FT-62	ZTM-FT-63
90-TO	Sunflower mixed pressed/extracted oil (pre-refined oil)	3 * 300g	ZOM-FT-70	ZOM-FT-71	ZOM-FT-62
11-CO	Spiked rapeseeds	3 * 300g	RC-FT-22	RC-FT-23	RC-FT-24
21-CO	Rapeseed flakes	3 * 300g	RF-FT-25	RF-FT-26	RF-FT-27
31-CO	Cooked rapeseed flakes	3 * 300g	RCM-FT-28	RCM-FT-29	RCM-FT-30
41-CO	Rapeseed press-cake	3 * 300g	RPC-FT-31	RPC-FT-32	RPC-FT-33
51-CO	Rapeseed pressed oil	3 * 300g	ROP-FT-40	ROP-FT-41	ROP-FT-42
61-CO	Rapeseed white flakes (extraction meal)	3 * 300g	RWF-FT-34	RWF-FT-35	RWF-FT-36
71-CO	Rapeseed extraction oil	3 * 300g	ROE-FT-40	ROE-FT-41	ROE-FT-42
81-CO	Rapeseed toasted extraction meal	3 * 300g	RTM-FT-37	RTM-FT-38	RTM-FT-39
91-CO	Rapeseed mixed pressed/extracted oil (pre-refined oil)	3 * 300g	ROM-FT-73	ROM-FT-74	ROM-FT-75
12-SO	Spiked soybeans	3 * 300g	SC-FT-01	SC-FT-02	SC-FT-03
102-SO	Dehulled soybeans (kernels)	3 * 300g	SO-FT-07	SO-FT-08	SO-FT-09
112-SO	Soy hulls	3 * 300g	SH-FT-04	SH-FT-05	SH-FT-06
22-SO	Soybean flakes	3 * 300g	SF-FT-10	SF-FT-11	SF-FT-12
62-SO	Soybean white flakes (extraction meal)	3 * 300g	SWF-FT-16	SWF-FT-17	SWF-FT-18
72-SO	Soybean extraction oil	3 * 300g	SOE-FT-13	SOE-FT-14	SOE-FT-15
82-SO	Soybean toasted extraction meal	3 * 300g	SMT-FT-19	SMT-FT-20	SMT-FT-21

Part 2: *ITERG samples for ADM.*

Product	Identification (ITERG)	Number aliquots (total weight)
Sunflower mixed pressed/extracted oil (pre-refined oil)	139/CPTC211146910/HuToTa	2 x 2.5 kg (5 kg)
Rapeseed mixed pressed/extracted oil (pre-refined oil)	138/CPTC211146910/HuToTa	2 x 2.5 kg (5 kg)
Soybean extraction oil	140/CPTC211146910/HuToTa	2 x 2.5 kg (5 kg)

***Part 3**: ADM samples for WFSR.*

Product	Bottles	Total amount [g]
Rapeseed oil crude	1	150
Trial 1 - Rapeseed oil caustic washed	4	500
Trial 1 - Rapeseed oil caustic washed - Soap	1	38
Trial 1 - Rapeseed oil, caustic washed, bleached	3	430
Trial 1 – Rapeseed oil, caustic washed, bleached - Bleaching clay	1	20
Trial 1 – Rapeseed oil, caustic washed, bleached, deodorized	3	900
Trial 1 – Rapeseed oil, caustic washed, bleached, deodorized - Fatty acid distillate	1	50
Trial 2 – Rapeseed oil, degummed	4	580
Trial 2 – Rapeseed oil, degummed - watery phase	1	45
Trial 2 – Rapeseed oil, degummed, bleached	3	335
Trial 2 – Rapeseed oil, degummed, bleached - Bleaching clay	1	20
Trial 2 – Rapeseed oil, degummed, bleached, deodorized	3	900
Trial 2 – Rapeseed oil, degummed, bleached, deodorized - fatty acid distillate	1	50
Sunflowerseed oil crude	1	140
Trial 3 – Sunflower oil, caustic washed	4	620
Trial 3 – Sunflower oil, caustic washed - soap	1	32
Trial 3 – Sunflower oil, caustic washed, bleached	3	400
Trial 3 – Sunflower oil, caustic washed, bleached - bleaching clay	1	20
Trial 3 – Sunflower oil, caustic washed, bleached, deodorized	3	900
Trial 3 – Sunflower oil, caustic washed, bleached, deodorized - fatty acid distillate	1	50
Trial 4 – Sunflower oil, degummed	3	480
Trial 4 – Sunflower oil, degummed - watery phase	1	25
Trial 4 – Sunflower oil, degummed, bleached	3	330
Trial 4 – Sunflower oil, degummed, bleached - bleaching clay	1	18
Trial 4 – Sunflower oil, degummed, bleached, deodorized	3	900
Trial 4 – Sunflower oil, degummed, bleached, deodorized - fatty acid distillate	1	90
Soybean oil crude	1	130
Trial 5 – Soybean oil, degummed	6	950
Trial 5 – Soybean oil, degummed - watery phase	1	45
Trial 5 – Soybean oil, degummed, bleached	8	1100
Trial 5 – Soybean oil, degummed, bleached - bleaching clay	1	30
Trial 5 – Soybean oil, degummed, bleached, deodorized	3	900
Trial 5 – Soybean oil, degummed, bleached, deodorized - fatty acid distillate	1	100

Sampling lists are given in Annexes 1,2 and 3.

Oil and moisture analysis

Oil and moisture level of (1) the three intact oilseeds, (2) sunflower and rapeseed press cake and (3) extraction meal of the three oilseeds were analyzed at ITERG.

Oil and moisture content were also determined in the blank samples of the untreated intact oil seeds and in all oil and meal samples from the study at WFSR. A sub-sample of approximately 5-20 g was taken for this purpose as described in the sample lists in Annexes 1, 2 and 3. The following WFSR SOPs were used for oil and moisture determination:

- A-0732 Ruwvetgehalte (intact oil seeds and meal derived from the oil seeds)
- N-0272 Vochtgehalte (intact oil seeds and meal derived from the oil seeds)
- N-0417 Vochtgehalte (pressed and extracted crude oil)

2.5 Statistical analysis

Statistical analysis was performed for the homogeneity of the pesticide concentrations in the harvested oilseeds. Raw data was corrected for the recovery rate during analysis, this corrected data was used for all analyses.

The statistical analysis for homogeneity included a z-score test. The z-scores were calculated using the formula $z=(x-\mu)/\sigma$. Using a z-score reference table it was determined whether or not the z-score was significantly deviant from the mean in a 95% confidence interval. |z-scores| > ±1.96 were considered significantly deviant. A sample showing >2 significantly deviant z-scores is considered a deviant sample. Homogeneity was calculated for every oilseed separately.

A pesticide was considered homogenously distributed over the oilseed when the following criteria were met:
1. Not more than two z-scores within the 10 samples for a specific pesticide deviating significantly on one side of the distribution;
2. Not more than 2 deviant pesticides in any of the 10 samples.

Distribution of the pesticides over the processed products is given in Table 13. No statistical analyses were performed.

To calculate indicative processing factors, pesticide values in the processed products below the reported LOQ were nominally used at the LOQ level to perform the calculation. For example, <100 was converted into 100 (= LOQ), to calculate a minimum, least risk processing factor. The processing factor (Pf) was calculated as follows:

Pf = residue concentration in processed product / residue concentration in the Raw Material.

3 Results

3.1 Fat and moisture analyses

Tables 8, 9 and 10 show the fat and moisture content of the raw materials and processed products produced during the field study. All samples were analyzed at WFSR, except the samples with the addition 'ITERG'. Those samples were analyzed at ITERG, France. From literature it is expected that soybeans will contain 18%-21% oil and rapeseeds and sunflower seeds between 40%-45% oil (Fediol, 2022). Soybeans were only extracted and not pressed before extraction like rapeseeds and sunflower seeds, due to the lower oil content of soybeans. This is in accordance with common practice in the industry.

Table 8 *Fat and moisture content in soybean and processed soybean products.*

Soybean or processed product	Moisture content (%)	Oil content (%)
Intact soybean and crushed soybean fractions		
Soybean	9.5	22.3
Soybean ITERG	9.2	20.6
Soybean dehulled	10.1	21.8
Soybean hulls	12.7	0.8
Soybean flakes	9.6	21.7
Soybean white flakes	9.8	6.3
Soybean meal toasted	11.6	6.8
Soybean meal toasted ITERG	10.9	5.9
Physically refined soybean oil fractions		
Soybean oil extracted (Extracted crude oil)	3.4	96.6
Soybean oil, degummed	3.3	96.7
Soybean oil, degummed – watery phase	Insufficient amount of material	
Soybean oil, degummed, bleached	2.4	97.6
Soybean oil, degummed, bleached, deodorized	<LOQ	100.0
Soybean oil degummed bleached deodorized distillate	Insufficient amount of material	

Table 9 *Fat and moisture content in rapeseed and processed rapeseed products.*

Rapeseed or processed product	Moisture content (%)	Oil content (%)
Intact rapeseed and crushed rapeseed fractions		
Rapeseed	6.1	48.8
Rapeseed - ITERG	6.3	47.6
Rapeseed flakes	5.7	49.4
Rapeseed cooked material	2.6	51.0
Rapeseed press cake	4.0	20.5
Rapeseed press cake - ITERG	4.1	19.9
Rapeseed white flakes	6.5	2.6
Rapeseed white flakes - ITERG	7.3	1.6
Rapeseed toasted meal	7.2	2.7
Physically refined rapeseed oil fractions		
Rapeseed oil pressed	<LOQ	100
Rapeseed oil extracted	3.8	96.2
Rapeseed oil mixed (Pre-refined oil)	1.3	98.7
Rapeseed oil, degummed	1.3	98.7
Rapeseed oil degummed - watery phase	Insufficient amount of material	
Rapeseed oil degummed bleached	1.0	99.0
Rapeseed oil degummed bleached deodorized	<LOQ	100.0
Rapeseed oil degummed bleached fatty acid distillate	Insufficient amount of material	
Chemically refined rapeseed oil fractions		
Rapeseed oil mixed (Pre-refined oil)	1.3	98.7
Rapeseed oil caustic washed	1.1	98.9
Rapeseed oil, caustic washed, bleached	0.8	99.2
Rapeseed oil caustic washed bleached deodorized	<LOQ	100.0
Rapeseed oil, caustic washed, bleached, deodorized distillate	Insufficient amount of material	

Table 10 *Fat and moisture content in sunflower seed and processed sunflower seed products.*

Sunflower seed or processed product	Moisture content (%)	Oil content (%)
Intact sunflower seed and crushed sunflower seed fractions		
Sunflower seed	5.7	44.3
Sunflower seed - ITERG	6.1	47.6
Sunflower seed flakes	5.6	44.1
Sunflower seed cooked	1.1	46.9
Sunflower seed press cake	<0.1	22.8
Sunflower seed press cake - ITERG	0.4	21.8
Sunflower seed white flakes	4.8	1.2
Sunflower seed white flakes - ITERG	10.9	5.9
Sunflower seed toasted meal	5.5	1.1
Physically refined sunflower seed oil fractions		
Sunflower seed oil pressed	<LOQ	100.0
Sunflower seed oil extracted	3.7	96.3
Sunflower seed oil mixed (Pre-refined oil)	0.8	99.2
Sunflower seed oil, degummed	0.8	99.2
Sunflower seed oil, degummed - watery phase	Insufficient amount of material	
Sunflower seed oil, degummed, bleached	0.5	99.5
Sunflower seed oil, degummed, bleached, deodorized	<LOQ	100.0
Sunflower seed oil, degummed, bleached, fatty acid distillate	Insufficient amount of material	
Chemically refined sunflower seed oil fractions		
Sunflower seed oil mixed (Pre-refined oil)	0.8	99.2
Sunflower seed oil, caustic washed	0.7	99.3
Sunflower seed oil, caustic washed bleached	Not Determined	
Sunflower seed oil, caustic washed, bleached, deodorized	<LOQ	100.0
Sunflower seed oil, caustic washed, bleached, deodorized distillate	Insufficient amount of material	

3.2 Pesticide analyses

3.2.1 Homogeneity

The samples were singularly analyzed. A z-score comparison was chosen to assess whether the 10 samples were within the range of +1.96 or -1.96 (i.e. ±1.96 standard deviations (σ) from the mean in the standard normal distribution) of the mean of each of the pesticide concentrations in the samples of the intact oilseeds. The z-scores from this field experiment are shown in Table 11. In this Table, the z-scores that deviated more than ±1.96 are marked in pink.

Summarized results: for each specific pesticide, maximally only 1 out of 10 samples showed a z-score larger than ±1.96 and of the 10 samples only 1 sample (no. 9) showed 3 pesticides with a z-score larger than ±1.96.

Set criteria:

1. Not more than two z-scores within the 10 samples for a specific pesticide deviating significantly on one side of the distribution;
2. Not more than 2 deviant pesticides in any of the 10 samples.

Since the criteria were met, all pesticides were considered homogenously distributed over the oilseed batches.

Table 11 *Z-scores and significance of homogeneous distribution of pesticides in soybean, rapeseed and sunflower seed.*

Table 11.1 *Soybean.*

	acetamiprid	cypermethrin	deltamethrin	Metalaxyl*	pirimicarb	pirimiphos-methyl	prothioconazole-desthio	tebuconazole
Sample 1	0.82	-2.04	-1.28	ND	-0.20	-0.82	0.82	-0.74
Sample 2	-0.54	-0.42	-0.55	ND	-1.18	-1.06	-0.62	0.26
Sample 3	-0.14	-0.16	-1.19	ND	-0.58	-0.37	0.04	0.33
Sample 4	-0.94	-0.65	0.00	ND	-0.43	-0.63	-0.57	-1.35
Sample 5	0.55	0.24	-0.52	ND	-0.49	-0.54	-0.26	-0.80
Sample 6	-0.98	-0.12	-0.03	ND	-0.21	0.01	-0.92	-0.29
Sample 7	-1.43	-0.01	1.34	ND	-0.22	-0.18	-1.26	-0.86
Sample 8	-0.03	1.25	-0.38	ND	-0.08	0.78	-0.37	0.71
Sample 9	1.67	0.33	1.34	ND	2.37	2.36	1.77	1.97
Sample 10	1.02	1.58	1.28	ND	1.03	0.44	1.37	0.77

* Z-score table for soybeans, metalaxyl was below LOQ; ND: z-score was Not Determined.

Table 11.2 *Rapeseed.*

	acetamiprid	cypermethrin	deltamethrin	metalaxyl	pirimicarb	pirimiphos-methyl	prothioconazole-desthio	tebuconazole
Sample 1	-0.33	0.43	0.18	-0.28	-0.22	-0.21	-0.53	-0.32
Sample 2	-0.72	-0.59	-1.24	-0.70	-0.39	-0.52	-0.72	-0.56
Sample 3	-1.57	-0.77	-1.13	-1.39	-1.45	-1.24	-1.37	-2.07
Sample 4	-0.77	0.92	0.31	-0.98	-0.74	-0.90	-0.77	-0.65
Sample 5	-0.12	-1.28	-1.66	0.32	-0.18	-0.13	-0.07	0.44
Sample 6	0.86	-0.90	0.51	1.47	0.91	0.37	1.97	1.09
Sample 7	0.89	-0.92	0.67	0.90	0.54	0.27	0.53	0.60
Sample 8	1.72	1.31	1.21	1.31	1.89	2.12	0.98	1.09
Sample 9	0.65	0.47	0.08	0.20	0.64	1.02	0.53	0.85
Sample 10	-0.63	1.35	1.06	-0.84	-1.01	-0.78	-0.56	-0.48

Table 11.3 *Sunflower seed.*

	acetamiprid	cypermethrin	deltamethrin	Metalaxyl*	pirimicarb	pirimiphos-methyl	prothioconazole-desthio	tebuconazole
Sample 1	0.87	-0.16	0.27	ND	-0.69	0.12	-0.32	0.00
Sample 2	-0.80	-0.78	-0.77	ND	-0.97	-1.76	-0.62	-1.51
Sample 3	1.04	0.45	-0.67	ND	0.40	0.71	0.02	1.30
Sample 4	0.47	0.43	1.47	ND	-0.36	0.67	0.95	0.06
Sample 5	-0.40	-1.90	-1.32	ND	0.01	-0.86	-1.11	-0.63
Sample 6	-1.25	0.53	0.30	ND	0.14	-1.17	-1.21	-0.40
Sample 7	0.40	-0.82	0.22	ND	2.10	1.00	-0.28	0.47
Sample 8	-1.47	-0.28	-0.87	ND	-1.48	-0.42	-0.46	-1.39
Sample 9	1.47	1.51	1.72	ND	0.84	1.13	1.39	1.27
Sample 10	-0.32	1.02	-0.34	ND	0.02	0.59	1.64	0.83

* Z-score table for sunflower seed, metalaxyl was below LOQ; ND: z-score was Not Determined.

3.2.2 Pesticide content of oilseeds and storage stability of the pesticides after field treatment of the crops

LC-MS/MS analyses were performed in order to see whether the intended (estimated) exaggerated nominal concentration (Table 6) of pesticides on the oilseeds after field treatment of the crops was recovered during the laboratory tests. The estimated values and analyzed mean value per pesticide are given in Table 12A. An estimation of storage stability of the pesticides is given in Table 12B.

Table 12A *Intended & analyzed average pesticide concentration for specific pesticides in the oilseeds.*

Pesticide	**Intended exaggerated pesticide concentration after field treatment (mg/kg)**	**Analyzed pesticide concentration (Mean±SD; mg/kg; N=10)**		
	All oilseeds	**Soybeans**	**Rapeseeds**	**Sunflower seeds**
Acetamiprid	0.4	0.24 ± 0.031	1.57 ± 0.298	0.44 ± 0.029
Pirimicarb	0.05	0.17 ± 0.038	0.58 ± 0.097	0.82 ± 0.073
Metalaxyl	0.02	<LOQ	0.03 ± 0.007	<LOQ
Prothioconazole-desthio	Not pre-selected*	0.01 ± 0.002	0.04 ± 0.014	0.02 ± 0.002
Tebuconazole	0.5	2.26 ± 0.274	8.32 ± 1.162	4.20 ± 0.445
Pirimiphos-methyl	0.5	0.04 ± 0.01	0.26 ± 0.054	0.35 ± 0.034
Deltamethrin	0.2	0.08 ± 0.015	0.18 ± 0.034	0.13 ± 0.012
Cypermethrin	0.2	0.15 ± 0.044	0.31 ± 0.079	0.26 ± 0.028

* Prothioconazole-desthio was unintentionally part of the commercially available metalaxyl-formulation that was used in this study.

Table 12B *Estimated storage stability of specific pesticides in the oilseeds after harvest.*

Pesticide	**Mean pesticide concentration (mg/kg)**								
	Soybeans Samples at harvest (N=10)	**Soybeans Samples at ITERG (N=3)**	**% of the conc. at harvest**	**Rapeseeds Samples at harvest (N=10)**	**Rapeseeds Samples at ITERG (N=3)**	**% of the conc. at harvest**	**Sunflower Samples at harvest (N=10)**	**Sunflower Samples at ITERG (N=3)**	**% of the conc. at harvest**
Acetamiprid	0.24	0.13	46%↓	1.57	0.64	59%↓	0.44	0.46	5%↑
Pirimicarb	0.17	0.10	51%↓	0.58	0.31	47%↓	0.82	0.79	4%↓
Metalaxyl	<LOQ	<LOQ	-	0.03	0.011	63%↓	<LOQ	<LOQ	-
Prothioconazole-desthio	0.01	<LOQ	-	0.04	0.01	75%↓	0.02	0.02	0%
Tebuconazole	2.26	1.58	30%↓	8.32	3.68	66%↓	4.20	4.30	2%↑
Pirimiphos-methyl	0.04	0.02	50%↓	0.26	0.14	46%↓	0.35	0.35	0%
Deltamethrin	0.08	0.071	11%↓	0.18	0.10	44%↓	0.13	0.15	15%↑
Cypermethrin	0.15	0.08	47%↓	0.31	0.15	52%↓	0.26	0.24	8%↓

Storage stability

Storage stability of the pesticides in the harvested intact oilseeds were not specifically addressed, but relevant information can be drawn from Table 12B. Samples at harvest (N=10) were taken on 25th of October 2021, directly shipped to WFSR and stored in a freezer until analysis in Feb/March 2022. Samples at ITERG (N=3) were taken from the harvested batch (stored at room temperature) on 13th of November 2021, shipped to WFSR and stored in a freezer until analysis in Feb/March 2022 (see also Table 1). The main difference between the two types of samples is the approximate 3-week period in which the storage temperature was different: harvest samples (<-18ºC) *versus* ITERG samples (room temperature). The data in Table 12B indicate that 3 weeks storage at room temperature resulted in:

- Soybeans: decrease in pesticide concentration ranging from -11% to -51%
- Rapeseeds: decrease in pesticide concentration ranging from -44% to -75%
- Sunflowerseeds: no obvious trend, changes ranging from -8% to +15%

The difference in storage temperature most probably explains the differences between Tables 12A and 13. The samples of the unprocessed oilseeds taken at ITERG were used in the dataset for calculation of the processing factors, because these samples share the same transport and storage history as the processed oilseed products.

Exaggerated pesticide application
The purpose of the 5x-10x exaggerated pesticide application over normal concentrations was to ensure sufficiently high levels of pesticides in the raw materials, hence enabling measurable concentrations in the processed fractions. This is an essential precondition for the ability to subsequently derive meaningful processing factors for crops from field-applications with pesticides. For this reason exaggerated pesticide application as such is required in the OECD 508 Guideline. For single pesticide applications and especially for pesticide cocktails, the amount of overdosing remains an educated estimate. The results of this study give insight in the validity of a 5x–10x exaggerated pesticide application using pesticide cocktails in a field study with oilseed crops.

Overall, intentionally high and measurable concentrations were found in all oilseeds for all selected pesticides, except metalaxyl. This pesticide was, although applied at 10x the normal concentration, was not recovered in soybeans and sunflower seeds. It was, however, recovered around the intended concentration in rapeseed. Tebuconazole was recovered at 5-15 times higher than the intended concentration, whereas Pirimiphos-methyl was recovered at 3-10 times lower than the intended concentration. The other selected pesticides were recovered either slightly below or slightly above the intended concentration. Prothioconazole-desthio was not included in the pesticide calculation because this pesticide was not pre-selected. It was unintentionally part of the commercially available metalaxyl-formulation that was used in this study.

Generally, it was concluded that the obtained pesticide concentrations in the oilseeds were sufficiently high for the purpose of this study, with the exception of metalaxyl for soybeans and sunflower seeds.

3.2.3 Pesticide content of oilseeds after processing

The effect of processing on the pesticide concentrations in different processed products of the oilseeds is described in Tables 13.1-13.3.

Table 13.1 *Mean pesticide concentrations (±SD) in soybean and processed soybean products (mg/kg).*

Soybean and processed soybean products	N	acetamiprid	±SD*	pirimicarb	±SD	metalaxyl	±SD	prothioconazole-desthio	±SD	tebuconazole	±SD	pirimiphos-methyl	±SD	deltamethrin	±SD	cypermethrin	±SD
Soybean	3	0.13	0.062	0.10	0.035	<0.01		<0.01		1.58	0.646	0.02	0.014	0.071		0.08	0.026
Soybean hulls	3	2.27	0.075	1.42	0.099	0.03	0.002	0.10	0.003	18.15	5.638	0.37	0.010	0.67	0.088	1.36	0.119
Soybean dehulled	3	0.10	0.003	0.07	0.002	<0.01		<0.01		0.90	0.068	0.01	0.001	<0.05		0.061	
Soybean flakes	3	0.36	0.110	0.17	0.033	<0.01		0.02	0.007	3.26	1.669	0.04	0.010	0.08	0.025	0.16	0.044
Soybean white flakes	3	0.25	0.172	0.15	0.083	<0.01		0.011		0.84	0.460	0.03	0.021	<0.05		0.061	
Soybean meal toasted	3	0.18	0.017	0.08	0.006	<0.01		<0.01		0.66	0.036	<0.01		<0.05		<0.05	
Soybean oil extracted	3	0.04	0.001	0.26	0.009	<0.01		0.03	0.040	6.97	0.272	0.16	0.011	0.25	0.083	0.52	0.165
Soybean crude oil	1	0.03		0.27		<0.01		0.03		8.15		0.11		0.34		0.65	
Soybean oil, degummed	4	0.03	0.000	0.27	0.006	<0.01		0.03	0.029	7.34	0.650	0.11	0.001	0.28	0.027	0.63	0.074
Soybean oil, degummed-watery phase	1	0.13		0.29		<0.01		0.02		9.50		0.06		0.08		0.19	
Soybean oil, degummed, bleached	4	<0.01		<0.01		<0.01		0.02	0.001	4.41	0.409	0.03	0.001	0.28	0.059	0.51	0.042
Soybean oil , degummed, bleached, **bleaching clay**	1	<0.01		ND		0.01		0.08		30.88		0.68		0.12		0.19	
Soybean oil, degummed, bleached, deodorized	2	<0.01		<0.01		<0.01		0.01	0.001	3.56	0.231	<0.01		0.24	0.083	0.37	0.148
Soybean oil, degummed, bleached, deodorized - **fatty acid distillate**	1	<0.01		<0.01		0.07		0.12		12.92		0.67		<0.05		0.12	
LogKow		**0.8**		**1.7**		**1.8**		**3.0**		**3.7**		**4.2**		**4.6**		**5.6**	

*Where N > 1 the Standard Deviation (SD) is given; "<*value*" means: <LOQ
[1]N=1 and the other 2 samples were <LOQ
ND: Not Determined

Table 13.2 *Mean pesticide concentrations (±SD) in rapeseed and processed rapeseed products (mg/kg).*

Rapeseed and processed rapeseed products	N	acetamiprid	±SD*	pirimicarb	±SD	metalaxyl	±SD	prothioconazole-desthio	±SD	tebuconazole	±SD	pirimiphos-methyl	±SD	deltamethrin	±SD	cypermethrin	±SD
Rapeseed	3	0.64	0.066	0.31	0.015	0.011		0.01	0.002	3.68	0.445	0.14	0.020	0.10	0.013	0.15	0.009
Rapeseed flakes	3	0.69	0.191	0.32	0.039	0.011		0.02	0.005	3.70	1.330	0.13	0.021	0.11	0.017	0.19	0.024
Rapeseed cooked material	3	1.07	0.081	0.38	0.033	0.02	0.003	0.02	0.002	5.76	0.536	0.17	0.011	0.14	0.009	0.21	0.021
Rapeseed press cake	3	2.62	0.480	0.81	0.135	0.04	0.006	0.06	0.006	10.54	0.870	0.27	0.024	0.14	0.006	0.19	0.006
Rapeseed white flakes	3	3.51	0.260	1.01	0.086	0.05	0.003	0.05	0.004	8.64	0.399	0.14	0.002	<0.05		0.08	0.009
Rapeseed toasted meal	3	2.97	0.723	0.69	0.182	0.05	0.003	0.05	0.004	8.15	0.809	0.08	0.008	<0.05		0.08	0.062
Rapeseed oil extracted	3	0.07	0.002	0.53	0.023	0.03	0.001	0.07	0.002	17.40	1.784	0.91	0.021	0.55	0.080	0.89	0.133
Rapeseed oil pressed	3	0.05	0.000	0.16	0.000	<0.01		0.02	0.000	7.68	0.623	0.39	0.003	0.49	0.038	0.96	0.035
Rapeseed oil mixed (pre-refined oil)	1	0.06		0.29		0.02		0.04		8.86		0.39		0.60		0.99	
Rapeseed oil caustic washed	4	0.04	0.001	0.25	0.009	0.01	0.001	0.04	0.003	9.99	1.167	0.52	0.024	0.58	0.041	1.16	0.083
Rapeseed oil caustic washed - Soap	1	0.16		0.18		0.02		0.03		11.41		0.20		0.10		0.14	
Rapeseed oil, caustic washed, bleached	3	<0.01		<0.01		<0.01		0.03	0.002	3.84	0.113	0.05	0.000	0.56	0.083	1.08	0.117
Rapeseed oil, caustic washed, bleached - **bleaching clay**	1	0.04		0.39		0.38		0.58		246.13		14.74		0.24		0.47	
Rapeseed oil, caustic washed, bleached, deodorized	3	<0.01		<0.01		<0.01		0.01	0.001	3.17	0.077	<0.01		0.54	0.038	1.29	0.135
Rapeseed oil, caustic washed, bleached, deodorized - **deodorized distillate**	1	<0.01		<0.01		0.10		0.10		7.19		0.80		0.07		0.21	
Rapeseed oil, degummed	4	0.05	0.002	0.25	0.011	0.02	0.061	0.04	0.002	10.24	1.169	0.40	0.004	0.49	0.065	0.83	0.029
Rapeseed oil, degummed - watery phase	1	0.25		0.71		0.02		0.04	0.012	14.53		0.23		0.19		0.48	
Rapeseed oil, degummed, bleached	3	<0.01		<0.01		0.01	0.000	0.02	0.002	1.60	0.055	<0.01		0.55	0.007	1.19	0.123
Rapeseed oil, degummed, bleached - **bleaching clay**	1	<0.01		ND		0.301		1.37		374.55		13.39		0.25		0.42	
Rapeseed oil, degummed, bleached, deodorized	2	<0.01		<0.01		<0.01		0.01	0.000	1.46	0.129	<0.01		0.61	0.040	1.27	0.022
Rapeseed oil, degummed, bleached, deodorized - **fatty acid distillate**	1	<0.01		<0.01		0.16		0.09		4.40		0.15		0.06		0.13	
LogKow		**0.8**		**1.7**		**1.8**		**3.0**		**3.7**		**4.2**		**4.6**		**5.6**	

*Where N > 1 the Standard Deviation (SD) is given; "<value" means: <LOQ
[1]N=1 and the other 2 samples were <LOQ
ND: Not Determined

Table 13.3 *Mean pesticide concentrations (±SD) in sunflower seed and processed sunflower seed products (mg/kg).*

Sunflower seed and processed sunflower seed products	N	acetamiprid	±SD	pirimicarb	±SD	metalaxyl	±SD	prothioconazole-desthio	±SD	tebuconazole	±SD	pirimiphos-methyl	±SD	deltamethrin	±SD	cypermethrin	±SD
Sunflower seed	3	0.46	0.005	0.79	0.062	<0.01		0.02	0.002	4.30	0.329	0.35	0.064	0.15	0.045	0.24	0.075
Sunflower seed flakes	3	0.46	0.034	0.85	0.067	0.011		0.03	0.002	4.70	0.536	0.40	0.034	0.09	0.001	0.15	0.003
Sunflower seed cooked material	3	0.47	0.072	0.82	0.139	0.01	0.001	0.02	0.002	4.12	0.676	0.32	0.022	0.14	0.007	0.23	0.025
Sunflower seed press cake	3	0.65	0.010	0.94	0.077	0.01	0.000	0.02	0.001	4.08	0.362	0.24	0.015	0.10	0.005	0.17	0.013
Sunflower seed white flakes	3	0.84	0.051	0.93	0.066	0.01	0.001	0.02	0.093	2.97	0.179	0.09	0.006	<0.05		<0.05	
Sunflower seed toasted meal	3	0.78	0.095	0.84	0.084	0.01	0.001	0.02	0.002	2.75	0.412	0.05	0.007	<0.05		<0.05	
Sunflower oil extracted	3	0.05	0.002	0.92	0.044	0.01	0.000	0.04	0.002	7.00	0.159	0.61	0.010	0.22	0.015	0.29	0.023
Sunflower oil pressed	3	0.03	0.003	0.57	0.037	<0.01		0.02	0.003	5.01	0.220	0.67	0.030	0.29	0.171	0.58	0.033
Sunflower oil mixed	3	0.03	0.001	0.65	0.098	<0.01		0.03	0.001	5.53	1.098	0.64	0.077	0.20	0.037	0.32	0.061
Sunflower oil crude (Pre-refined oil)	1	0.03		0.70		<0.01		0.03		5.64		0.50		0.29		0.55	
Sunflower oil, caustic washed	4	0.02	0.001	0.71	0.030	0.261		0.03	0.002	5.82	0.360	0.53	0.026	0.29	0.029	0.47	0.079
Sunflower oil, caustic washed - soap	1	0.08		0.47		0.02		0.02		5.17		0.13		<0.05		<0.05	
Sunflower oil, caustic washed, bleached	3	<0.01		<0.01		<0.01		0.012	0.000	1.00	0.358	0.032	0.001	0.35	0.137	0.54	0.211
Sunflower oil, caustic washed, bleached - **bleaching clay**	1	0.06		ND		0.26		0.60		122.06		14.69		0.14		0.23	
Sunflower oil, caustic washed, bleached, deodorized	3	<0.01		<0.01		<0.01		<0.01		0.39	0.017	<0.01		0.22	0.078	0.34	0.173
Sunflower oil, caustic washed, bleached, deodorized - **deodorized distillate**	1	<0.01		<0.01		0.01		0.01		0.80		0.07		<0.05		0.06	
Sunflower oil, degummed	3	0.032	0.010	0.44	0.376	0.03	0.038	0.04	0.011	4.55	2.523	0.41	0.275	0.182	0.007	0.30	0.200
Sunflower oil, degummed - watery phase	1	0.09		1.90		<0.01		0.02		4.26		0.26		0.10		0.24	
Sunflower oil, degummed, bleached	3	<0.01		<0.01		<0.01		<0.01		0.50	0.011	<0.01		0.39	0.011	0.58	0.043
Sunflower oil, degummed, bleached - **bleaching clay**	1	<0.01		<0.01		0.02		0.02		0.92		0.14		<0.05		0.10	
Sunflower oil, degummed, bleached, deodorized	3	<0.01		<0.01		<0.01		<0.01		0.56	0.024	<0.01		0.55	0.112	0.75	0.182
Sunflower oil, degummed, bleached, deodorized - **fatty acid distillate**	1	0.03		0.63		<0.01		0.03		5.46		0.50		0.15		0.27	
LogKow		**0.8**		**1.7**		**1.8**		**3.0**		**3.7**		**4.2**		**4.6**		**5.6**	

*Where N > 1 the Standard Deviation (SD) is given; "<value" means: <LOQ
[1]N=1 and the other 2 or 3 samples were <LOQ
[2]N=2 and the other 1 samples was <LOQ
ND: Not Determined

3.2.4 Experimental processing factors

The processing factor was calculated as the quotient of the concentration in the raw agricultural commodity and the concentration in the processed product (Scholz et al., 2017). Some samples showed analytical results below the LOQ (<0.050 mg/kg or <0.010 mg/kg, depending on the pesticide) or results above the range of quantification (>5mg/kg), because these results do not have an exact and reliable value they were not taken into account for processing factor calculation.

Tables 14.1, 14.2 and 14.3 show the Processing factor (Pf) values for pesticides in oilseeds and processed oilseed products (soybeans, rapeseed and sunflower seed, respectively). Table 14 follows the oilseed crushing and oil refining production steps as described in Figures 3A and 3B and lists the selected pesticides according to ascending LogKow. For convenient review, the values are marked in different colors as follows:

- Green: Pf ≤ 1.0;
- Yellow: 1.0 < Pf ≤ 3.0;
- Red: Pf > 3.0.

When applying processing factors the following should be taken into account:

Pf > 1: Residues are concentrated in the processed product;
Pf < 1: Residues are declined in the processed product;
Pf = 1: Processing did not result in a change of residue concentrations.

So the green color in Table 14 represents the samples showing declined or unchanged residue concentrations in the processed products and the yellow + red colors and the represent the samples showing concentrated residues in the processed products.

3.2.5 Possible interpretation/application of processing factors in practice

In February 2022 the European Committee published an Information Note which has the intention to provide guidance to Member States (including Official Control Laboratories) on how to implement Article 20 provisions of Regulation (EC) 396/2005 in a harmonized way, ultimately leading to a situation by which processing factors established by one Member State could be mutually accepted by other Member States. Importantly, this document also provides indications for Food and Feed Business Operators, to prepare themselves and have the necessary information at hand if national authorities request further documentation during their official controls[3]. The currently described research aims to follow the guidance given in the Information Note, in order to determine whether the processing factors for the selected pesticide-processed product combinations resulting from this field study are applicable in practice.

For illustrative and exemplary purposes, a few fictive residue levels for pesticide-product combinations were chosen and the experimentally-derived processing factors were used according to the method given in the Information Note to illustrate whether the residue level in the processed fraction would be compliant to Regulation (EC) 396/2005 or not, by using a "derived MRL". Some examples are given in Table 15.

[3] https://food.ec.europa.eu/system/files/2022-02/pesticides_mrl_guidelines_proc_imp_sante-2021-10704.pdf

Table 14.1 *Processing factors for pesticides in soybeans and processed soybean products.*

Pesticide:	acetamiprid	pirimicarb	metalaxyl	prothioconazole-desthio	tebuconazole	pirimiphos-methyl	deltamethrin	cypermethrin
LogKow:	0.8	1.7	1.8	3.0	3.7	4.2	4.6	5.6
Soybean and processed soybean products								
Soybean	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Soybean hulls	17.0	14.2	3.1	7.9	11.5	17.6	10.2	16.7
Soybean dehulled	0.8	0.7	ND	ND	0.6	0.7	ND	0.7
Soybean flakes	2.7	1.7	ND	1.4	2.1	1.8	1.2	2.0
Soybean white flakes	1.9	1.5	ND	1.2	0.5	1.4	ND	0.8
Soybean meal toasted	1.4	0.9	ND	ND	0.4	ND	ND	ND
Soybean oil extracted	0.3	2.6	ND	2.3	4.4	7.5	3.8	6.4
Soybean crude oil	0.3	2.7	ND	2.3	5.2	5.2	5.2	8.0
Soybean oil, degummed	0.2	2.7	ND	2.4	4.6	5.2	4.2	7.8
Soybean oil, degummed-watery phase	1.0	2.9	ND	1.8	6.0	2.9	1.2	2.4
Soybean oil, degummed, bleached	ND	ND	ND	1.9	2.8	1.5	4.2	6.3
Soybean oil , degummed, bleached, **bleaching clay**	ND	ND	1.4	6.3	19.5	32.2	1.8	2.4
Soybean oil, degummed, bleached, deodorized	ND	ND	ND	1.0	2.2	ND	3.7	4.5
Soybean oil, degummed, bleached, deodorized - **fatty acid distillate**	ND	ND	7.4	9.8	8.2	31.6	ND	1.5

Green: Pf ≤ 1.0; Yellow: 1.0 ≤ Pf ≤ 3.0; Red: Pf > 3.0; NM = Not Determined.

Table 14.2 *Processing factors for pesticides in rapeseed and processed rapeseed products.*

Pesticide:	acetamiprid	pirimicarb	metalaxyl	prothioconazole-desthio	tebuconazole	pirimiphos-methyl	deltamethrin	cypermethrin
LogKow:	0.8	1.7	1.8	3.0	3.7	4.2	4.6	5.6
Rapeseed and processed rapeseed products								
Rapeseed	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Rapeseed flakes	1.1	1.0	1.1	1.1	1.0	0.9	1.1	1.3
Rapeseed cooked material	1.7	1.2	1.8	1.7	1.6	1.2	1.3	1.4
Rapeseed press cake	4.1	2.6	4.4	4.3	2.9	1.9	1.3	1.3
Rapeseed white flakes	5.5	3.3	4.6	3.7	2.3	1.0	ND	0.6
Rapeseed toasted meal	4.6	2.3	4.4	3.6	2.2	0.6	ND	0.5
Rapeseed oil extracted	0.1	1.7	3.0	5.1	4.7	6.4	5.3	6.0
Rapeseed oil pressed	0.1	0.5	ND	1.7	2.1	2.7	4.7	6.5
Rapeseed oil mixed (pre-refined oil)	0.1	0.9	1.6	3.0	2.4	2.7	5.8	6.7
Rapeseed oil caustic washed	0.1	0.8	1.4	2.7	2.7	3.6	5.6	7.8
Rapeseed oil caustic washed - Soap	0.2	0.6	1.8	2.5	3.1	1.4	1.0	1.0
Rapeseed oil, caustic washed, bleached	ND	ND	ND	1.9	1.0	0.4	5.4	7.3
Rapeseed oil, caustic washed, bleached - **bleaching clay**	0.1	1.3	37.3	41.2	66.8	103.4	2.3	3.2
Rapeseed oil, caustic washed, bleached, deodorized	ND	ND	ND	0.9	0.9	ND	5.2	8.7
Rapeseed oil, caustic washed, bleached, deodorized - **deodorized distillate**	ND	ND	9.6	7.2	2.0	5.6	0.7	1.4
Rapeseed oil, degummed	0.1	0.8	1.6	3.0	2.8	2.8	4.6	5.6
Rapeseed oil, degummed - watery phase	0.4	2.3	1.5	2.7	3.9	1.6	1.8	3.2
Rapeseed oil, degummed, bleached	ND	ND	1.1	1.2	0.4	ND	5.3	8.0
Rapeseed oil, degummed, bleached - **bleaching clay**	ND	ND	29.5	97.6	101.7	93.9	2.4	2.9
Rapeseed oil, degummed, bleached, deodorized	ND	ND	ND	0.8	0.4	ND	5.8	8.6
Rapeseed oil, degummed, bleached, deodorized - **fatty acid distillate**	ND	ND	15.5	6.6	1.2	1.1	0.6	0.9

Green: Pf ≤ 1.0; Yellow: 1.0 ≤ Pf ≤ 3.0; Red: Pf > 3.0; NM = Not Determined.

Table 14.3 *Processing factors for pesticides in sunflower seed and processed sunflower seed products.*

Pesticide:	acetamiprid	pirimicarb	metalaxyl	prothioconazole-desthio	tebuconazole	pirimiphos-methyl	deltamethrin	cypermethrin
LogKow:	0.8	1.7	1.8	3.0	3.7	4.2	4.6	5.6
Sunflower seed and processed sunflower seed products								
Sunflower seed	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sunflower seed flakes	1.0	1.1	1.0	1.2	1.1	1.2	0.6	0.6
Sunflower seed cooked material	1.0	1.0	1.0	1.2	1.0	0.9	0.9	1.0
Sunflower seed press cake	1.4	1.2	1.1	1.1	0.9	0.7	0.7	0.7
Sunflower seed white flakes	1.8	1.2	1.1	0.9	0.7	0.2	ND	ND
Sunflower seed toasted meal	1.7	1.1	1.1	0.9	0.6	0.2	ND	ND
Sunflower oil extracted	0.1	1.2	1.2	1.9	1.6	1.7	1.5	1.2
Sunflower oil pressed	0.1	0.7	ND	1.2	1.2	1.9	2.0	2.4
Sunflower oil mixed	0.1	0.8	ND	1.4	1.3	1.8	1.4	1.3
Sunflower oil crude (Pre-refined oil)	0.1	0.9	ND	1.4	1.3	1.4	2.0	2.3
Sunflower oil, caustic washed	0.0	0.9	7.2	1.5	1.4	1.5	2.0	2.0
Sunflower oil, caustic washed - soap	0.2	0.6	1.9	1.0	1.2	0.4	ND	ND
Sunflower oil, caustic washed, bleached	ND	ND	ND	0.5	0.2	0.1	2.4	2.2
Sunflower oil, caustic washed, bleached - **bleaching clay**	0.1	ND	25.9	29.0	28.4	42.0	0.9	1.0
Sunflower oil, caustic washed, bleached, deodorized	ND	ND	ND	ND	0.1	ND	1.5	1.4
Sunflower oil, caustic washed, bleached, deodorized - **deodorized distillate**	ND	ND	1.3	0.7	0.2	0.2	ND	0.3
Sunflower oil, degummed	0.0	0.6	3.2	1.9	1.1	1.2	1.2	1.3
Sunflower oil, degummed - watery phase	0.2	2.4	ND	1.1	1.0	0.7	0.7	1.0
Sunflower oil, degummed, bleached	ND	ND	ND	ND	0.1	ND	2.7	2.4
Sunflower oil, degummed, bleached - **bleaching clay**	ND	ND	2.2	1.2	0.2	0.4	ND	0.4
Sunflower oil, degummed, bleached, deodorized	ND	ND	ND	ND	0.1	ND	3.7	3.1
Sunflower oil, degummed, bleached, deodorized - **fatty acid distillate**	0.1	0.8	ND	1.5	1.3	1.4	1.0	1.1

Green: Pf ≤ 1.0; Yellow: 1.0 ≤ Pf ≤ 3.0; Red: Pf > 3.0; NM = Not Determined.

Table 15 *Examples of possible applications of processing factors in practice.*

Acetamiprid - Log Kow = 0.8					
Residue level in processed product (± 50%)	**MRL**	**Processing factor from field study**	**"Derived MRL" for a processed product/fraction**	**Status of the sample according to Regulation (EC) No 396/2005**	
0.025 ± 0.0125 mg/kg in soybeans (dehulled)	0.01 mg/kg in soybeans	0.8	0.01x0.8=0.008 Derived MRL < 0.01, thus derived MRL is set at 0.01 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.0125 > 0.01)
0.025 ± 0.0125 mg/kg in soybean meal toasted	0.01 mg/kg in soybeans	1.4	0.01x1.4=0.014 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.0125 < 0.014)
0.025 ± 0.0125 mg/kg in soybean oil extracted	0.01 mg/kg in soybeans	0.3	0.01x0.3=0.003 mg/kg Derived MRL < 0.01, thus derived MRL is set at 0.01 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.0125 > 0.01)
0.025 ± 0.0125 mg/kg in rapeseed flakes	0.4 mg/kg in rapeseed	1.1	0.4x1.1=0.44 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.0125 < 0.44)
0.025 ± 0.0125 mg/kg in rapeseed toased meal	0.4 mg/kg in rapeseed	4.6	0.4x4.6=1.88 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.0125 < 1.88)
0.025 ± 0.0125 mg/kg in rapeseed oil extracted	0.4 mg/kg in rapeseed	0.1	0.4x0.1=0.04 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.0125 < 0.04)
0.025 ± 0.0125 mg/kg in sunflower seed flakes	0.01 mg/kg in sunflower seeds	1.0	0.01x1.0=0.01 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.0125 > 0.01)
0.025 ± 0.0125 mg/kg in sunflower seed toasted meal	0.01 mg/kg in sunflower seeds	1.7	0.01x1.7=0.017 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.0125 < 0.017)
0.025 ± 0.0125 mg/kg in sunflower oil extracted	0.01 mg/kg in sunflower seeds	0.1	0.01x0.1-0.001 Derived MRL < 0.01, thus derived MRL is set at 0.01 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.0125 > 0.01)

Pirimicarb - Log Kow = 1.7					
Residue level in processed product (± 50%)	**MRL**	**Processing factor from field study**	**"Derived MRL" for a processed product/fraction**	**Status of the sample according to Regulation (EC) No 396/2005**	
0.05 ± 0.025 mg/kg in soybeans (dehulled)	0.02 mg/kg in soybeans	0.7	0.02x0.7=0.014 Derived MRL < 0.02, thus derived MRL is set at 0.02 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.025 > 0.02)
0.05 ± 0.025 mg/kg in soybean meal toasted	0.02 mg/kg in soybeans	0.9	0.02x0.9=0.018 mg/kg Derived MRL < 0.02, thus derived MRL is set at 0.02 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.025 > 0.02)
0.05 ± 0.025 mg/kg in soybean oil extracted	0.02 mg/kg in soybeans	2.6	0.02x2.6=0.052 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.052)
0.05 ± 0.025 mg/kg in rapeseed flakes	0.05 mg/kg in rapeseed	1.0	0.05x1.0=0.05 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.05)
0.05 ± 0.025 mg/kg in rapeseed toased meal	0.05 mg/kg in rapeseed	2.3	0.05x2.3=0.115 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.115)
0.05 ± 0.025 mg/kg in rapeseed oil extracted	0.05 mg/kg in rapeseed	1.7	0.05x1.7=0.085 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.085)
0.05 ± 0.025 mg/kg in sunflower seed flakes	0.1 mg/kg in sunflower seeds	1.1	0.1x1.1=0.11	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.11)
0.05 ± 0.025 mg/kg in sunflower seed toasted meal	0.1 mg/kg in sunflower seeds	1.1	0.1x1.1=0.11	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.11)
0.05 ± 0.025 mg/kg in sunflower oil extracted	0.1 mg/kg in sunflower seeds	1.2	0.1x1.2=0.12	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.12)

Deltametrin - Log Kow = 4.6					
Residue level in processed product (± 50%)	**MRL**	**Processing factor from field study**	**"Derived MRL" for a processed product/fraction**	**Status of the sample according to Regulation (EC) No 396/2005**	
0.05 ± 0.025 mg/kg in soybeans (dehulled)	0.02 mg/kg in soybeans	0.8	0.02x0.8=0.016 Derived MRL < 0.02, thus derived MRL is set at 0.02 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.025 > 0.02)
0.05 ± 0.025 mg/kg in soybean meal toasted	0.02 mg/kg in soybeans	0.8	0.02x0.8=0.016 mg/kg Derived MRL < 0.02, thus derived MRL is set at 0.02 mg/kg	Not Compliant	Rationale: lower level of residue range is higher than "derived MRL" (0.025 > 0.02)
0.05 ± 0.025 mg/kg in soybean oil extracted	0.02 mg/kg in soybeans	3.8	0.02x3.8=0.076 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.076)
0.05 ± 0.025 mg/kg in rapeseed flakes	0.2 mg/kg in rapeseed	1.1	0.2x1.1=0.22 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.22)
0.05 ± 0.025 mg/kg in rapeseed toased meal	0.2 mg/kg in rapeseed	0.5	0.2x0.5=0.1 mg/kg Derived MRL < 0.2, thus derived MRL is set at 0.2 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.2)
0.05 ± 0.025 mg/kg in rapeseed oil extracted	0.2 mg/kg in rapeseed	5.3	0.2x5.3=1.06 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 1.06)
0.05 ± 0.025 mg/kg in sunflower seed flakes	0.05 mg/kg in sunflower seeds	0.6	0.05x0.6=0.03 Derived MRL < 0.05, thus derived MRL is set at 0.05 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.05)
0.05 ± 0.025 mg/kg in sunflower seed toasted meal	0.05 mg/kg in sunflower seeds	0.3	0.05x0.3=0.015 Derived MRL < 0.05, thus derived MRL is set at 0.05 mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.05)
0.05 ± 0.025 mg/kg in sunflower oil extracted	0.05 mg/kg in sunflower seeds	1.5	0.05x1.5=0.075mg/kg	Compliant	Rationale: lower level of residue range is lower than "derived MRL" (0.025 < 0.075)

ND = not determined.

4 Discussion and conclusions

4.1 Study design and conduct

This study was conducted in the spirit of the OECD 508 Guideline on the testing of chemicals "Magnitude of the Pesticide Residues in Processed Commodities' (OECD, 2008) and OECD Guideline 509 "Crop field trial" (OECD, 2021). The field trial designed for this study was intended to meet the requirements of OECD 508/509 as much as possible. However, full compliance with OECD 508/509 cannot be claimed (for example, the study was not performed according to GLP). By using multiple crops and multiple pesticides, much additional information can be extracted compared to a study investigating only one crop and one pesticide at the same time. Moreover, this study also covers most of the recommendations given in the Crop Field Trial Test Guideline 509 (OECD, 2021). One of the main objectives of OECD 509 crop field trials is to determine the magnitude of the pesticide residue in or on raw agricultural commodities, including feed items, using proposed or established good agricultural practice (GAP). In the current field trial we used 5-10-times exaggerated as well as mixed pesticide applications as compared to GAP use, which resulted in quantifiable residues for most of the selected pesticides in most of the processed fractions. See Table 5 for a comparison of OECD 508/509 *versus* the current field study design.

Conclusion
It can be concluded that the current field study design facilitated very efficient determination of residues and processing factors for 8 pesticides in processed soybean, rapeseed and sunflower seed products.

4.2 Processing of oilseeds

In this study, the oilseeds were cultivated under conditions comparable to practice. Pesticides were applied in an exaggerated manner, as required by OECD Test No. 508 (Magnitude of the Pesticide Residues in Processed Commodities). In contrast to the pilot study, the oilseeds were spiked with pesticide during crop growth which is much more realistic to agricultural practice than spiking whole oilseeds on a semi-industrial scale in the laboratory. Although the oilseeds are not regularly cultivated in the Netherlands, they grew well. The yield was as expected and sufficient for processing.

The processing as described in Section 2.4 was not exactly the same as in practice, since variation in processing methods exists among companies. However, the currently chosen methods and general processing schemes were considered representative for the industry. Some processing steps were difficult to mimic on a pilot scale, for example the deodorization step during refining was slightly different. On an industrial scale, the deodorized distillates and the fatty acid distillates are trapped at a higher temperature than at the pilot scale. Moreover, at industrial scale sometimes systems are used where the distillates are trapped in two steps at two different temperatures. Industrial scale deodorization systems result in a lower moisture content than achieved during the lab scale spiking and field studies, in which during distillation a lower temperature and only one step was used.

Conclusion
Partners from industry agreed, that the overall processing scheme from Section 2.4 sufficiently represents the processing conditions in industrial practice.

4.3 Oil and moisture analyses

Oil and moisture level were analysed as described in Section 2.5. Some fractions that were analysed in the pilot study could not be analysed in the field study. As indicated in Section 2.3, some sample material was lost during the transportation from ITERG to ADM and therefore some moisture analyses could not be performed due to insufficient amounts of material.

Soybeans
The oil and moisture level for soybean crushing were as expected. The oil content in intact soybeans, dehulled soybeans and soybean flakes was similar, which was as expected considering the stage of the processing. The hulls contained less oil than intact beans or kernels, which was also as expected. White flakes and toasted meal had a lower oil level, as a logical result of the extraction procedure. The moisture content was similar for soybean, dehulled soybean, hulls, flakes, white flakes and toasted meal. Only extracted oil had a lower moisture content. This could be due to the removal of hexane after oil extraction, through which also some moisture may be removed. Ultimately, 6-7% residual oil and 11-12% moisture remained in the toasted meal of soybeans.

Rapeseed and sunflower seed
The oil and moisture levels for rapeseed and sunflower crushing were as expected. The oil content in rapeseed, sunflower seeds and their flakes were similar, which was as expected considering the stage of the processing. Cooking reduced the moisture level and resulted in somewhat higher oil level in the cooked flakes. Pressing the cooked rapeseed or sunflower seed flakes resulted in removal of more than half the oil present and subsequent extraction with hexane removed most of the remaining oil from the press cake of both oilseeds. Ultimately, 1-3% residual oil and 5-7% moisture remained in the toasted meal of rapeseed and sunflower seed.

Soybeans, rapeseed and sunflower seed
During chemical refining of soybeans, rapeseed and sunflower seeds, the oil and moisture content was as expected. High oil levels were found in all fractions, which were increased as more water was removed in the course of the refining process.

Conclusion
The present results on oil and moisture analysis of processed oilseed products are in line with what can be expected in industrial practice.

4.4 Homogeneity

Few samples among the oilseeds in the homogeneity test showed z-score values significantly deviating from the mean. For each specific pesticide, maximally only 1 out of 10 samples showed a z-score larger than ±1.96 and of the 10 samples only 1 sample (no. 9) showed 3 pesticides with a z-score larger than ±1.96.

Conclusion
Since the pre-set criteria were met, all pesticides were considered homogenously distributed over the oilseed batches.

4.5 Pesticide content

4.5.1 Exaggerated application and storage stability of pesticides in the field study

Application. The purpose of the 5x-10x exaggerated pesticide application over normal concentrations was to ensure sufficiently high levels of pesticides in the raw materials, hence enabling measurable concentrations in the processed fractions. Overall, the results of this study give insight in the validity of a 5x–10x exaggerated pesticide application using pesticide cocktails in a field study with oilseed crops

(soybeans, rapeseed and sunflower). Generally, intentionally high and measurable concentrations were found in all oilseeds for all selected pesticides, except metalaxyl. This pesticide was only recovered at quantifiable levels in rapeseed products. At the low end, Pirimiphos-methyl was recovered at 3-10 times lower than the intended concentration and at the high end, Tebuconazole was recovered at 5-15 times higher than the intended concentration.

Storage stability. Storage stability was not explicitly addressed in this study. However, recovery of quantifiable concentrations of all pesticides, except metalaxyl, in all three crops are indicative of sufficient storage stability under the experimental conditions of this study.

Conclusion
It was concluded that the obtained pesticide concentrations in the oilseeds were sufficiently high for the purpose of this study, with the exception of metalaxyl for processed products of soybeans and sunflower seeds.

4.5.2 Processed products of oilseeds

All fractions were analyzed for pesticides. Sufficient material for these analyses remained available for analysis, despite some material was lost during the transportation from ITERG to ADM.
Pesticide concentrations were in most cases sufficiently high for pesticide analyses and processing factor calculation. In contrast to the lab scale spiking pilot experiment, there was no delay between the scheduled field-spraying, harvest and scheduled processing. Therefore, it was not expected that pesticides deteriorated between harvest and processing.

Although the three crops received a similar spraying regimen in the field, some differences in average pesticide concentration between the three oilseeds were seen. In general, soybean and processed soybean products showed lower average pesticide concentrations than processed rapeseed and sunflower seed products. This difference between pesticide concentration in soybeans and the other oilseeds is most probably caused by the fact that the processing of soybeans included a dehulling step. This is supported by the observation that the soybean hulls contained by far the highest levels of pesticides, in comparison to the other processed soybean products. The decision of not using such a dehulling step for sunflower seeds in this study, may have influenced the overall pesticide concentrations in processed sunflower seed products in a similar way. However, in most cases the pesticide concentrations in processed sunflower seed products were lower than in rapeseed products, except for pirimicarb and pirimiphos-methyl.

The difference between rapeseeds and sunflower seeds cannot be explained directly, but it can possibly be due to the extent to which the pesticide can penetrate the oilseed. Where possible, the measurement uncertainty was taken into account for these values (Mean ± SD).

The recovery of the pesticides differed for some pesticides among the specific oilseeds. For rapeseeds and sunflower seed, this could be due to the penetration ability of the pesticides into the oilseed. Some evidence for this comes from the observation that metalaxyl was only recovered in quantifiable amounts in rapeseed products. Given that the metalaxyl concentration in the spraying formulation was the same for all 3 crops, this points to a more efficient uptake/penetration of metalaxyl in rapeseeds. As mentioned before, tebuconazole was recovered at much higher levels than intended and pirimiphos-methyl was recovered at levels much lower than the intended concentration. There was no ready explanation for this.

Conclusions
- Pesticide concentrations were in most cases sufficiently high for pesticide analyses and processing factor calculation;
- Although the three crops received a similar spraying regimen in the field, some differences in average pesticide concentration between the three oilseeds were seen. Either or not including a dehulling step in the process, is most probably an important factor in explaining these observed differences;
- The recovery of the pesticides differed for some pesticides among the specific oilseeds.

4.6 Processing effect on pesticide distribution and experimental processing factor

4.6.1 Pesticide distribution

The pesticide level was analysed in all fractions of the three oilseeds. The pesticides in the cocktail had LogKow values ranging from 0.8 to 5.6, suggesting a variable increasing range of hydro- to lipophilicity of the active substances.

To review a simplified representation of the oilseed crushing process, the processed products are roughly split into two fractions: meals and oils. In Table 16 the qualitative distribution of the pesticides over these two fractions according to ascending LogKow is given. For this interpretation ↑ means a higher concentration than the intact oilseed and ↓ means a lower concentration than the intact oilseed (based on data from Tables 13.1-13.3).

Table 16 *Qualitative distribution of pesticides in oilseed crushing.*

LogKow	0.8	1.7	1.8	3.0	3.7	4.2	4.6	5.6
	acetamiprid	pirimicarb	metalaxyl	prothioconazole -desthio	tebuconazole	pirimiphos-methyl	deltamethrin	cypermethrin
Soybean (intact)	0	0	ND	0	0	0	0	0
Soybean meal toasted	↑	↓	ND	0	↓	↓	↓	↓
Soybean oil extracted	↓	↑	ND	↑	↑	↑	↑	↑
Rapeseed (intact)	0	0	0	0	0	0	0	0
Rapeseed toasted meal	↑	↑	↑	↑	↑	↓	↓	↓
Rapeseed oil mixed	↓	↓	↑	↑	↑	↑	↑	↑
Sunflower seed (intact)	0	0	ND	0	0	0	0	0
Sunflower seed toasted meal	↑	↑	ND	0	↓	↓	↓	↓
Sunflower oil mixed	↓	↓	ND	↑	↑	↑	↑	↑

↑ = higher concentration than intact oilseed; ↓ = lower concentration than intact oilseed; ND = Not Determined.

Table 16 shows that for processed oils and meals, the direction of the arrows rather consistently flips around at a certain LogKow. However, below LogKow 3.7-4.2 this pattern is not the same for all three oilseeds (indicated in yellow). This indicates that the pesticide's LogKow may be predictive of the distribution of the pesticide in the processed oils and meals from oilseeds only at values ≥ 4.

To review a simplified representation of the oil refining process for oilseeds, the processed products are roughly split into two fractions: degummed-watery phase and refined oils (degummed, bleached, deodorized). In Table 16 the qualitative distribution of the pesticides over these two fractions according to ascending LogKow is given. For this interpretation ↑ means a higher concentration than the crude oil and ↓ means a lower concentration than the crude oil (based on data from Tables 13.1-13.3).

Table 17 *Qualitative distribution of pesticides in oilseed oil refining.*

LogKow	0.8	1.7	1.8	3.0	3.7	4.2	4.6	5.6
	acetamiprid	pirimicarb	metalaxyl	prothioconazole -desthio	tebuconazole	pirimiphos-methyl	deltamethrin	cypermethrin
Soybean crude oil	0	0	ND	0	0	0	0	0
Soybean oil, degummed-watery phase	↑	↑	ND	↓	↑	↓	↓	↓
Soybean refined oil	↓	↓	ND	↓	↓	↓	↓	↓
Rapeseed mixed crude oil	0	0	0	0	0	0	0	0
Rapeseed oil, degummed - watery phase	↑	↑	↑	0	↑	↓	↓	↓
Rapeseed refined oil	↓	↓	↑	↓	↓	↓	↑	↑
Sunflower mixed crude oil	0	0	ND	0	0	0	0	0
Sunflower oil, degummed - watery phase	↑	↑	ND	↓	↓	↓	↓	↓
Sunflower refined oil	↓	↓	ND	0	↓	↓	↑	↑

↑ = higher concentration than crude oil; ↓ = lower concentration than crude oil; ND = Not Determined.

Table 17 shows that for refined oils, the direction of the arrows is consistent up to LogKow < 3. However, at LogKow ≥ 3, the pattern is not always similar among the three oilseeds (indicated in yellow). Table 17 does not show a clear consistent predictive trend for the fate of pesticides in water- and oil fractions from oil refining based on LogKow.

Conclusion
Predictions of the fate of pesticides in processed oilseed products based on LogKow values, solely by comparing downstream pesticide concentrations, is most probably not reliable.

4.6.2 Processing factors

In this 'Discussion and Conclusions' section, the results for metalaxyl are not taken into account for the processing factors for soybeans and sunflower seed. Metalaxyl results are considered not reliable because of the extremely low recovery. Metalaxyl data for rapeseed are considered valid and are taken into account when calculating the Pfs.

Soybean
In soybean crushing (Table 14.1), the processing from intact soybean to toasted soybean meal resulted generally in Pf ≤ 1 (6 out of 7). Only acetamiprid showed a Pf of 1.4. This indicates that, irrespective of LogKow, most of the selected pesticides do not concentrate in soybean meal under conditions that represent the industrial practice.
The processing from intact soybean to crude soybean oil showed the opposite: Pf > 1 (6 out of 7). Only acetamiprid showed a Pf of 0.3. This indicates that most of the selected pesticides concentrate in soybean oil produced under conditions that represent the industrial practice. In this case, a slight trend was seen towards pesticides with a higher LogKow showing higher processing factors for the crude oil.

In soybean oil refining, the processing from crude soybean oil to refined soybean oil resulted in Pf ≤ 1 (LogKow ≤ 3) or Pf > 1 (LogKow ≥ 3.7), with the exception of pirimiphos-methyl. This indicates that pesticides with LogKow ≥ 3.7 may concentrate in refined soybean oil produced under conditions that represent the industrial practice.

Interestingly, the processing factors in soybean hulls were consistently (much) higher than 1 and ranged from 3.1 – 17.6, indicating that this fraction traps a significant part of each of the topically applied pesticides.

Rapeseed
In rapeseed crushing (Table 14.2), the processing from intact rapeseeds to toasted rapeseed meal resulted in Pf > 1 (5 out of 8) and Pf ≤ 1 (3 out of 8). Interestingly, the Pfs > 1 were seen at LogKow 0.8-3.7 and the Pfs ≤ 1 at LogKow 4.2-5.6. This indicates that the selected pesticides with LogKow in the range of 0.8-3.7 may concentrate in rapeseed meal and the levels of the selected pesticides with LogKow in the range of 4.2-5.6 may decline in rapeseed meal produced under conditions that represent the industrial practice.
The processing from intact rapeseed to crude rapeseed oil resulted in Pf > 1 (6 out of 8). Only acetamiprid and pirimicarb showed Pfs of 0.3 and 0.9, respectively. This indicates that the selected pesticides with LogKow > 1.7 may concentrate in rapeseed oil under conditions that represent the industrial practice. Again, a slight trend was seen towards pesticides with a higher LogKow showing higher processing factors in the crude oil.

In chemical refining of rapeseed oil, the processing from crude rapeseed oil to refined rapeseed oil resulted in Pf ≤ 1 (LogKow ≤ 4.2) and Pf > 1 (LogKow ≥ 4.6). This indicates that pesticides with LogKow ≥ 4.6 may concentrate in chemically refined rapeseed oil under conditions that represent the industrial practice.

In physically refining of rapeseed oil, the processing from crude rapeseed oil to refined rapeseed oil resulted in processing factors that were almost identical to those of the chemical refined product:
Pf ≤ 1 (LogKow ≤ 4.2) and Pf > 1 (LogKow ≥ 4.6). This indicates that pesticides with LogKow ≥ 4.6 may concentrate in physically refined rapeseed oil under conditions that represent the industrial practice.

In chemical and physical refining of rapeseed oil and sunflower oil, the bleaching step was most efficient in removing pesticides from the processed oils. The processing factors in bleaching clay were consistently (much) higher than 1 and ranged from 1.2 – 103.4, indicating that this fraction traps a significant part of the selected pesticides. Remarkably, this effect of bleaching was much less pronounced in physically refined sunflower oil in comparison to chemically refined sunflower oil and chemically and physically refined rapeseed oil. The reason for this difference is unclear.

In refining oil from both oilseeds, deodorized distillate (chemical refining) and fatty acid distillate (physical refining).

Sunflower seed
In sunflower seed crushing (Table 14.3), the processing from intact sunflower seeds to toasted sunflower seed meal resulted in Pf > 1 (2 out of 7) and Pf ≤ 1 (5 out of 7). The Pfs > 1 were seen at LogKow 0.8-1.7 and the Pfs ≤ 1 at LogKow ≥ 3. This indicates that, at LogKow 0.8-1.7, the selected pesticides may concentrate and at LogKow ≥ 3, the levels of the selected pesticides may decline in sunflower seed meal produced under conditions that represent the industrial practice.
The processing from intact sunflower seed to crude sunflower seed oil showed processing factors resulted in Pf ≤ 1 (2 out of 7) at LogKow 0.8-1.7 and Pf >1 (5 out of 7) at LogKow ≥ 3. This indicates that the selected pesticides with LogKow > 1.7 may concentrate in sunflower seed oil under conditions that represent the industrial practice. Again, a slight trend was seen towards pesticides with a higher LogKow showing higher processing factors in the crude oil.

In chemical refining of sunflower seed oil, the processing from crude sunflower seed oil to refined sunflower seed oil resulted in Pf ≤ 1 (LogKow ≤ 4.2) and Pf > 1 (LogKow ≥ 4.6). This indicates that pesticides with LogKow ≥ 4.6 may concentrate in chemically refined sunflower seed oil under conditions that represent the industrial practice.

In physically refining of sunflower seed oil, the processing from crude sunflower seed oil to refined sunflower seed oil resulted in processing factors that were almost identical to those of the chemical refined product: Pf ≤ 1 (LogKow ≤ 4.2) or at Pf > 1 (LogKow ≥ 4.6). This indicates that pesticides with LogKow ≥ 4.6 may concentrate in physically refined sunflower seed oil under conditions that represent the industrial practice.

In Figures 4 to 7, the trend in Processing Factors in the same processed fractions is compared among the three oilseeds.

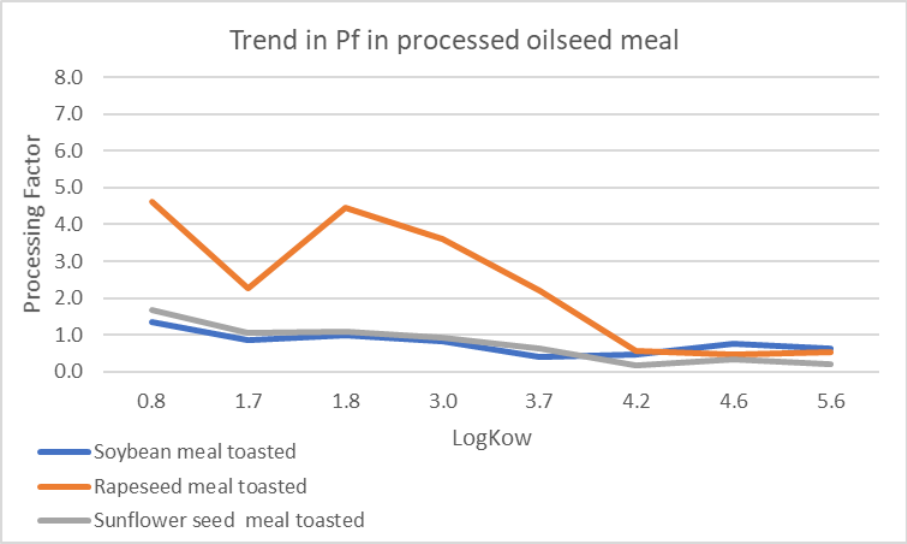


Figure 4 *Processing factors in toasted meal from soybeans rapeseed and sunflower seed.*

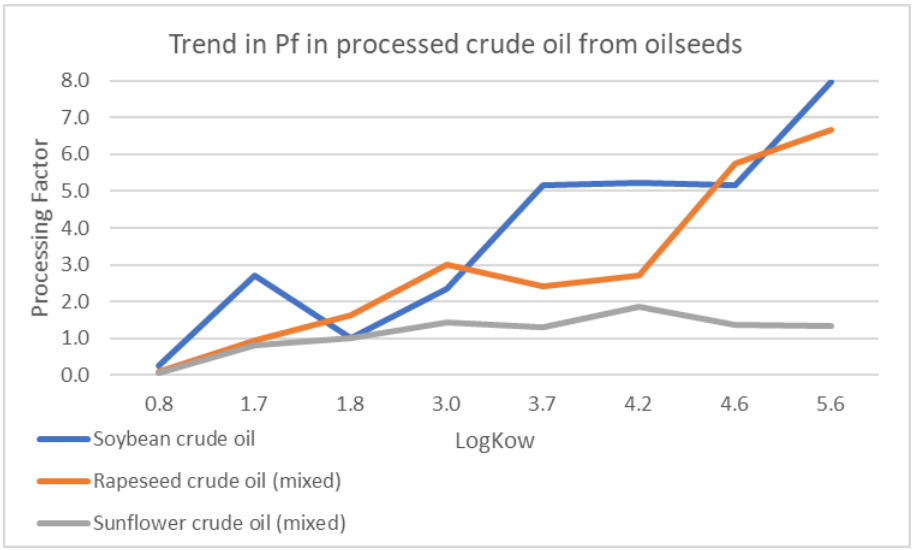


Figure 5 *Processing factors in crude oil from soybeans rapeseed and sunflower seed.*

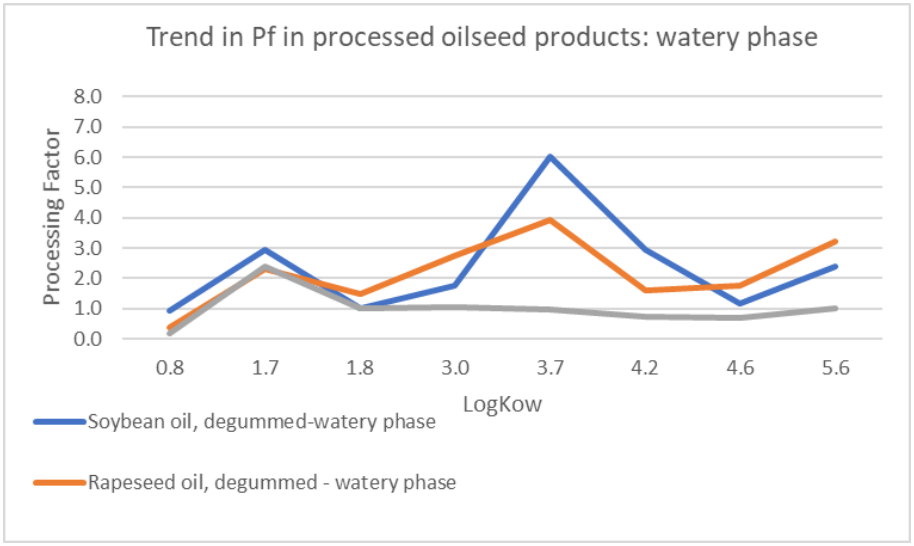


Figure 6 *Processing factors in degummed-watery phase of physically refined oil from soybeans rapeseed and sunflower seed.*

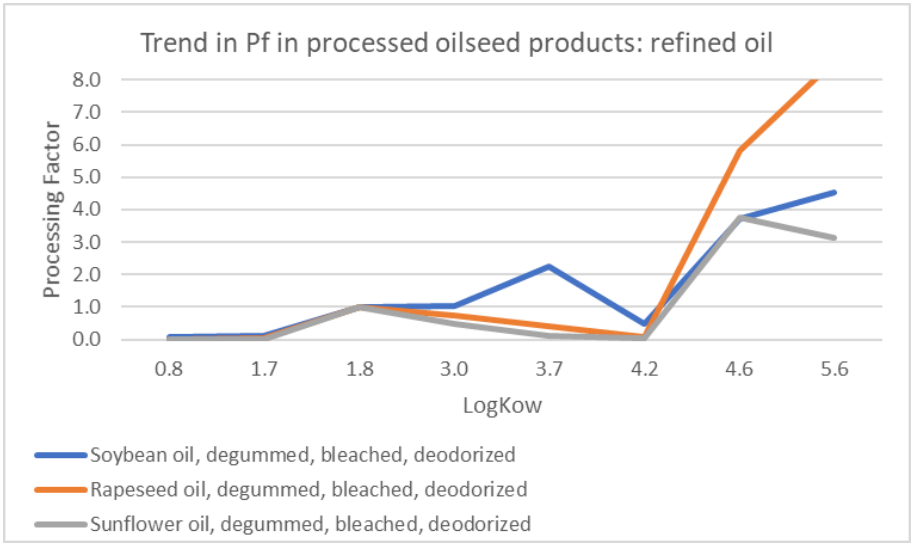


Figure 7 *Processing factors in physically refined oil from soybeans rapeseed and sunflower seed.*

Conclusions

- Overall, the processing factors determined in this field study are considered reliable and fit for the intended use;
- The trend in Processing Factors for pesticides as a function of LogKow for the same processed fraction (like meal, crude oil, aqueous extract or refined oil) is not always comparable among the three oilseeds.

4.6.3 Possible interpretation/application of processing factors in practice

Conclusion

Table 15 shows that the processing factors calculated from this field study for different processed oilseed products can be used without difficulty as input for processing factor calculation as described in the Information note on Article 20 of Regulation (EC) No 396/2005 as regards processing factors and composite food and feed.

It is advised to determine whether this study can be submitted to the EU database of processing factors for pesticide residues. In September 2022, EFSA has started the second update of the EU database of processing factors for pesticide residues (FPA GP/EFSA/AMU/2020/02) in collaboration with the German Federal Institute for Risk Assessment (BfR). The reference for contact is EFSA PESTICIDES MRL (pesticides.mrl@efsa.europa.eu).

References

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OECD, 2008. OECD 508, OECD GUIDELINE FOR THE TESTING OF CHEMICALS. Magnitude of the Pesticide Residues in Processed Commodities.

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Scholz, R., Herrmann, M., Michalski, B., 2017. Compilation of processing factors and evaluation of quality controlled data of food processing studies. Journal of Consumer Protection and Food Safety 12, 3-14.

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Annex 1 Sampling list homogeneity

Monsterlijst						
Verwerkingsfactoren pesticiden in diervoeding						
Projectnr: 1297380601						
Veldstudie met oliezaden						
						Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	RIKILT monsternummer
1	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad	Raapzaad Volgnummer: 01 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-01-2021 Monsterplaats: nr. 1 Opslagcondities: < - 18°C en donker	RZB-01-2021	200637646
2	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 02 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-02-2021 Monsterplaats: nr. 2 Opslagcondities: < - 18°C en donker	RZB-02-2021	200637647
3	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 03 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-03-2021 Monsterplaats: nr. 3 Opslagcondities: < - 18°C en donker	RZB-03-2021	200637648
4	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 04 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-04-2021 Monsterplaats: nr. 4 Opslagcondities: < - 18°C en donker	RZB-04-2021	200637649
5	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 05 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-05-2021 Monsterplaats: nr. 5 Opslagcondities: < - 18°C en donker	RZB-05-2021	200637650
6	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 06 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-06-2021 Monsterplaats: nr. 6 Opslagcondities: < - 18°C en donker	RZB-06-2021	200637651
7	Pesticiden	A-1155	Raapzaad	Raapzaad Volgnummer: 07 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: augustus 2021 Product/fractie: Raapzaad/behandeld Monsternummer: RZB-07-2021 Monsterplaats: nr. 7 Opslagcondities: < - 18°C en donker	RZB-07-2021	200637652

						Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**	**RIKILT monsternummer**
8	Pesticiden	A-1155	Raapzaad	**Raapzaad** **Volgnummer: 08** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: augustus 2021** **Product/fractie: Raapzaad/behandeld** **Monsternummer: RZB-08-2021** **Monsterplaats: nr. 8** **Opslagcondities: < - 18°C en donker**	RZB-08-2021	200637653
9	Pesticiden	A-1155	Raapzaad	**Raapzaad** **Volgnummer: 09** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: augustus 2021** **Product/fractie: Raapzaad/behandeld** **Monsternummer: RZB-09-2021** **Monsterplaats: nr. 9** **Opslagcondities: < - 18°C en donker**	RZB-09-2021	200637654
10	Pesticiden	A-1155	Raapzaad	**Raapzaad** **Volgnummer: 10** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: augustus 2021** **Product/fractie: Raapzaad/behandeld** **Monsternummer: RZB-10-2021** **Monsterplaats: nr. 10** **Opslagcondities: < - 18°C en donker**	RZB-10-2021	200637655

Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	RIKILT monsternummer
11	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Sojabonen	**Sojabonen** **Volgnummer: 11** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-11-2021** **Monsterplaats: nr. 1** **Opslagcondities: < - 18°C en donker**	SBB-11-2021	200643610
12	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 12** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-12-2021** **Monsterplaats: nr. 2** **Opslagcondities: < - 18°C en donker**	SBB-12-2021	200643611
13	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 13** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-13-2021** **Monsterplaats: nr. 3** **Opslagcondities: < - 18°C en donker**	SBB-13-2021	200643612
14	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 14** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-14-2021** **Monsterplaats: nr. 4** **Opslagcondities: < - 18°C en donker**	SBB-14-2021	200643613
15	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 15** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-15-2021** **Monsterplaats: nr. 5** **Opslagcondities: < - 18°C en donker**	SBB-15-2021	200643614
16	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 16** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-16-2021** **Monsterplaats: nr. 6** **Opslagcondities: < - 18°C en donker**	SBB-16-2021	200643615
17	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 17** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-17-2021** **Monsterplaats: nr. 7** **Opslagcondities: < - 18°C en donker**	SBB-17-2021	200643616

Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	RIKILT monsternummer
18	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 18** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-18-2021** **Monsterplaats: nr. 8** **Opslagcondities: < - 18°C en donker**	SBB-18-2021	200643617
19	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 19** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-19-2021** **Monsterplaats: nr. 9** **Opslagcondities: < - 18°C en donker**	SBB-19-2021	200643618
20	Pesticiden	A-1155	Sojabonen	**Sojabonen** **Volgnummer: 20** **Type studie: Field study oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: oktober 2021** **Product/fractie: Sojabonen/behandeld** **Monsternummer: SBB-20-2021** **Monsterplaats: nr. 10** **Opslagcondities: < - 18°C en donker**	SBB-20-2021	200643619

						Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	RIKILT monsternummer
21	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 21 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-21-2021 Monsterplaats: nr. 1 Opslagcondities: < - 18°C en donker**	ZBB-21-2021	200651157
22	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 22 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-22-2021 Monsterplaats: nr. 2 Opslagcondities: < - 18°C en donker**	ZBB-22-2021	200651158
23	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 23 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-23-2021 Monsterplaats: nr. 3 Opslagcondities: < - 18°C en donker**	ZBB-23-2021	200651159
24	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 24 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-24-2021 Monsterplaats: nr. 4 Opslagcondities: < - 18°C en donker**	ZBB-24-2021	200651160
25	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 25 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-25-2021 Monsterplaats: nr. 5 Opslagcondities: < - 18°C en donker**	ZBB-25-2021	200651161
26	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 26 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-26-2021 Monsterplaats: nr. 6 Opslagcondities: < - 18°C en donker**	ZBB-26-2021	200651162
27	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 27 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-27-2021 Monsterplaats: nr. 7 Opslagcondities: < - 18°C en donker**	ZBB-27-2021	200651163

						Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**	**RIKILT monsternummer**
28	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 28 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-28-2021 Monsterplaats: nr. 8 Opslagcondities: < - 18°C en donker**	ZBB-28-2021	200651164
29	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 29 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-29-2021 Monsterplaats: nr. 9 Opslagcondities: < - 18°C en donker**	ZBB-29-2021	200651165
30	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 30 Type studie: Field study oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: oktober 2021 Product/fractie: Zonnebloemzaad/behandeld Monsternummer: ZBB-30-2021 Monsterplaats: nr. 10 Opslagcondities: < - 18°C en donker**	ZBB-30-2021	200651166

Annex 2 Sampling list processing ITERG

Monsterlijst							
Verwerkingsfactoren pesticiden in diervoeding							
Projectnr: 1297380601							
Veldstudie met oliezaden (Field oilseeds-05)							
							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	Monstercode Iterg	RIKILT monsternummer
1	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Sojaboon	Sojaboon Volgnummer: 01 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SC-FT-01-2021 Opslagcondities: < - 18°C en donker	SC-FT-01-2021	SC-FT-01	200651064
2	Pesticiden	A-1155	Sojaboon	Sojaboon Volgnummer: 02 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SC-FT-02-2021 Opslagcondities: < - 18°C en donker	SC-FT-02-2021	SC-FT-02	200651065
3	Pesticiden	A-1155	Sojaboon	Sojaboon Volgnummer: 03 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SC-FT-03-2021 Opslagcondities: < - 18°C en donker	SC-FT-03-2021	SC-FT-03	200651066
4	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Sojahullen	Sojahullen Volgnummer: 04 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SH-FT-04-2021 Opslagcondities: < - 18°C en donker	SH-FT-04-2021	SH-FT-04	200651067
5	Pesticiden	A-1155	Sojahullen	Sojahullen Volgnummer: 05 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SH-FT-05-2021 Opslagcondities: < - 18°C en donker	SH-FT-05-2021	SH-FT-05	200651068
6	Pesticiden	A-1155	Sojahullen	Sojahullen Volgnummer: 06 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Sojaboon/gespiked Monsternummer: SH-FT-06-2021 Opslagcondities: < - 18°C en donker	SH-FT-06-2021	SH-FT-06	200651069
7	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Sojaboon onthuld	Sojabonen onthuld Volgnummer: 07 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Onthulde sojabonen Monsternummer: SO-FT-07-2021 Opslagcondities: < - 18°C en donker	SO-FT-07-2021	SO-FT-07	200651070

							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label		RIKILT monsternummer
8	Pesticiden	A-1155	Sojaboon onthuld	**Sojabonen onthuld** **Volgnummer: 08** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Onthulde sojabonen** **Monsternummer: SO-FT-08-2021** **Opslagcondities: < - 18°C en donker**	SO-FT-08-2021	SO-FT-08	200651071
9	Pesticiden	A-1155	Sojaboon onthuld	**Sojabonen onthuld** **Volgnummer: 09** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Onthulde sojabonen** **Monsternummer: SO-FT-09-2021** **Opslagcondities: < - 18°C en donker**	SO-FT-09-2021	SO-FT-09	200651072
10	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Soja flakes	**Sojaflakes** **Volgnummer: 10** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Sojaflakes** **Monsternummer: SF-FT-10-2021** **Opslagcondities: < - 18°C en donker**	SF-FT-10-2021	SF-FT-10	200651073
11	Pesticiden	A-1155	Soja flakes	**Sojaflakes** **Volgnummer: 11** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Sojaflakes** **Monsternummer: SF-FT-11-2021** **Opslagcondities: < - 18°C en donker**	SF-FT-11-2021	SF-FT-11	200651074
12	Pesticiden	A-1155	Soja flakes	**Sojaflakes** **Volgnummer: 12** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Sojaflakes** **Monsternummer: SF-FT-12-2021** **Opslagcondities: < - 18°C en donker**	SF-FT-12-2021	SF-FT-12	200651075
13	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soja oil extracted	**Soja crude oil** **Volgnummer: 13** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja crude oil** **Monsternummer: SCO-FT-13-2021** **Opslagcondities: < - 18°C en donker**	SOE-FT-13-2021	SOE-FT-13	200651076
14	Pesticiden	A-1155	Soja oil extracted	**Soja crude oil** **Volgnummer: 14** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja crude oil** **Monsternummer: SCO-FT-14-2021** **Opslagcondities: < - 18°C en donker**	SOE-FT-14-2021	SOE-FT-14	200651077

							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label		RIKILT monsternummer
15	Pesticiden	A-1155	Soja oil extracted	**Soja crude oil** **Volgnummer: 15** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja crude oil** **Monsternummer: SCO-FT-15-2021** **Opslagcondities: < - 18°C en donker**	SOE-FT-15-2021	SOE-FT-15	200651078
16	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Soja white flakes	**Soja white flakes** **Volgnummer: 16** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja white flakes** **Monsternummer: SWF-FT-16-2021** **Opslagcondities: < - 18°C en donker**	SWF-FT-16-2021	SWF-FT-16	200651079
17	Pesticiden	A-1155	Soja white flakes	**Soja white flakes** **Volgnummer: 17** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja white flakes** **Monsternummer: SWF-FT-17-2021** **Opslagcondities: < - 18°C en donker**	SWF-FT-17-2021	SWF-FT-17	200651080
18	Pesticiden	A-1155	Soja white flakes	**Soja white flakes** **Volgnummer: 18** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja white flakes** **Monsternummer: SWF-FT-18-2021** **Opslagcondities: < - 18°C en donker**	SWF-FT-18-2021	SWF-FT-18	200651081
19	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Soja meal toasted	**Soja meal toasted** **Volgnummer: 19** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja meal toasted** **Monsternummer: SMT-FT-19-2021** **Opslagcondities: < - 18°C en donker**	SMT-FT-19-2021	SMT-FT-19	200651082
20	Pesticiden	A-1155	Soja meal toasted	**Soja meal toasted** **Volgnummer: 20** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja meal toasted** **Monsternummer: SMT-FT-20-2021** **Opslagcondities: < - 18°C en donker**	SMT-FT-20-2021 (aangetroffen: 82-SO)	SMT-FT-20	200651083
21	Pesticiden	A-1155	Soja meal toasted	**Soja meal toasted** **Volgnummer: 21** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: december 2021** **Product/fractie: Soja meal toasted** **Monsternummer: SMT-FT-21-2021** **Opslagcondities: < - 18°C en donker**	SMT-FT-21-2021	SMT-FT-21	200651084

							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label		RIKILT monsternummer
22	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad	**Raapzaad Volgnummer: 22 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad/gespiked Monsternummer: RC-FT-22-2021 Opslagcondities: < - 18°C en donker**	RC-FT-22-2021	RC-FT-22	200651085
23	Pesticiden	A-1155	Raapzaad	**Raapzaad Volgnummer: 23 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad/gespiked Monsternummer: RC-FT-23-2021 Opslagcondities: < - 18°C en donker**	RC-FT-23-2021	RC-FT-23	200651086
24	Pesticiden	A-1155	Raapzaad	**Raapzaad Volgnummer: 24 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad/gespiked Monsternummer: RC-FT-24-2021 Opslagcondities: < - 18°C en donker**	RC-FT-24-2021	RC-FT-24	200651087
25	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad flakes	**Raapzaad flakes Volgnummer: 25 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad flakes Monsternummer: RF-FT-25-2021 Opslagcondities: < - 18°C en donker**	RF-FT-25-2021	RF-FT-25	200651088
26	Pesticiden	A-1155	Raapzaad flakes	**Raapzaad flakes Volgnummer: 26 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad flakes Monsternummer: RF-FT-26-2021 Opslagcondities: < - 18°C en donker**	RF-FT-26-2021	RF-FT-26	200651089
27	Pesticiden	A-1155	Raapzaad flakes	**Raapzaad flakes Volgnummer: 27 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad flakes Monsternummer: RF-FT-27-2021 Opslagcondities: < - 18°C en donker**	RF-FT-27-2021	RF-FT-27	200651090
28	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad cooked material	**Raapzaad cooked material Volgnummer: 28 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad cooked material Monsternummer: RCM-FT-28-2021 Opslagcondities: < - 18°C en donker**	RCM-FT-28-2021	RCM-FT-28	200651091

							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label		RIKILT monsternummer
29	Pesticiden	A-1155	Raapzaad cooked material	**Raapzaad cooked material Volgnummer: 29 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad cooked material Monsternummer: RCM-FT-29-2021 Opslagcondities: < - 18°C en donker**	RCM-FT-29-2021	RCM-FT-29	200651092
30	Pesticiden	A-1155	Raapzaad cooked material	**Raapzaad cooked material Volgnummer: 30 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad cooked material Monsternummer: RCM-FT-30-2021 Opslagcondities: < - 18°C en donker**	RCM-FT-30-2021	RCM-FT-30	200651093
31	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad press cake	**Raapzaad press cake Volgnummer: 31 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad press cake Monsternummer: RPC-FT-31-2021 Opslagcondities: < - 18°C en donker**	RPC-FT-31-2021 (aangetroffen: 41-CO)	RPC-FT-31	200651094
32	Pesticiden	A-1155	Raapzaad press cake	**Raapzaad press cake Volgnummer: 32 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad press cake Monsternummer: RPC-FT-32-2021 Opslagcondities: < - 18°C en donker**	RPC-FT-32-2021	RPC-FT-32	200651095
33	Pesticiden	A-1155	Raapzaad press cake	**Raapzaad press cake Volgnummer: 33 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad press cake Monsternummer: RPC-FT-33-2021 Opslagcondities: < - 18°C en donker**	RPC-FT-33-2021	RPC-FT-33	200651096

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
34	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad white flakes	**Raapzaad white flakes Volgnummer: 34 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad white flakes Monsternummer: RWF-FT-34-2021 Opslagcondities: < - 18°C en donker**	RWF-FT-34-2021	RWF-FT-34	200651097
35	Pesticiden	A-1155	Raapzaad white flakes	**Raapzaad white flakes Volgnummer: 35 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad white flakes Monsternummer: RWF-FT-35-2021 Opslagcondities: < - 18°C en donker**	RWF-FT-35-2021	RWF-FT-35	200651098
36	Pesticiden	A-1155	Raapzaad white flakes	**Raapzaad white flakes Volgnummer: 36 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad white flakes Monsternummer: RWF-FT-36-2021 Opslagcondities: < - 18°C en donker**	RWF-FT-36-2021	RWF-FT-36	200651099
37	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Raapzaad toasted meal	**Raapzaad toasted meal Volgnummer: 37 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad toasted meal Monsternummer: RTM-FT-37-2021 Opslagcondities: < - 18°C en donker**	RTM-FT-37-2021	RTM-FT-37	200651100
38	Pesticiden	A-1155	Raapzaad toasted meal	**Raapzaad toasted meal Volgnummer: 38 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad toasted meal Monsternummer: RTM-FT-38-2021 Opslagcondities: < - 18°C en donker**	RTM-FT-38-2021 (aangetroffen: 81-CO)	RTM-FT-38	200651101

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
39	Pesticiden	A-1155	Raapzaad toasted meal	**Raapzaad toasted meal Volgnummer: 39 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad toasted meal Monsternummer: RTM-FT-39-2021 Opslagcondities: < - 18°C en donker**	RTM-FT-39-2021	RTM-FT-39	200651102
40	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Raapzaad oil extracted	**Raapzaad oil extracted Volgnummer: 40 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil extracted Monsternummer: ROE-FT-40-2021 Opslagcondities: < - 18°C en donker**	ROE-FT-40-2021	ROE-FT-40	200651103
41	Pesticiden	A-1155	Raapzaad oil extracted	**Raapzaad oil extracted Volgnummer: 41 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil extracted Monsternummer: ROE-FT-41-2021 Opslagcondities: < - 18°C en donker**	ROE-FT-41-2021	ROE-FT-41	200651104
42	Pesticiden	A-1155	Raapzaad oil extracted	**Raapzaad oil extracted Volgnummer: 42 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil extracted Monsternummer: ROE-FT-42-2021 Opslagcondities: < - 18°C en donker**	ROE-FT-42-2021	ROE-FT-42	200651105
43	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Raapzaad oil pressed	**Raapzaad oil pressed Volgnummer: 43 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil pressed Monsternummer: ROP-FT-43-2021 Opslagcondities: < - 18°C en donker**	ROP-FT-43-2021 (aangetroffen: ROP-FT-40-2021)	ROP-FT-43	200651106

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
44	Pesticiden	A-1155	Raapzaad oil pressed	**Raapzaad oil pressed Volgnummer: 44 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil pressed Monsternummer: ROP-FT-44-2021 Opslagcondities: < - 18°C en donker**	ROP-FT-44-2021 (aangetroffen: ROP-FT-41-2021)	ROP-FT-44	200651107
45	Pesticiden	A-1155	Raapzaad oil pressed	**Raapzaad oil pressed Volgnummer: 45 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil pressed Monsternummer: ROP-FT-45-2021 Opslagcondities: < - 18°C en donker**	ROP-FT-45-2021 (aangetroffen: ROP-FT-42-2021)	ROP-FT-45	200651108
46	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 46 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad/gespiked Monsternummer: ZC-FT-46-2021 Opslagcondities: < - 18°C en donker**	ZC-FT-46-2021	ZC-FT-46	200651109
47	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 47 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad/gespiked Monsternummer: ZC-FT-47-2021 Opslagcondities: < - 18°C en donker**	ZC-FT-47-2021	ZC-FT-47	200651110
48	Pesticiden	A-1155	Zonnebloemzaad	**Zonnebloemzaad Volgnummer: 48 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad/gespiked Monsternummer: ZC-FT-48-2021 Opslagcondities: < - 18°C en donker**	ZC-FT-48-2021	ZC-FT-48	200651111

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
49	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloemzaad flakes	**Zonnebloemzaad flakes Volgnummer: 49 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad flakes Monsternummer: ZF-FT-49-2021 Opslagcondities: < - 18°C en donker**	ZF-FT-49-2021	ZF-FT-49	200651112
50	Pesticiden	A-1155	Zonnebloemzaad flakes	**Zonnebloemzaad flakes Volgnummer: 50 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad flakes Monsternummer: ZF-FT-50-2021 Opslagcondities: < - 18°C en donker**	ZF-FT-50-2021	ZF-FT-50	200651113
51	Pesticiden	A-1155	Zonnebloemzaad flakes	**Zonnebloemzaad flakes Volgnummer: 51 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad flakes Monsternummer: ZF-FT-51-2021 Opslagcondities: < - 18°C en donker**	ZF-FT-51-2021	ZF-FT-51	200651114
52	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloemzaad cooked material	**Zonnebloemzaad cooked material Volgnummer: 52 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad cooked material Monsternummer: ZCM-FT-52-2021 Opslagcondities: < - 18°C en donker**	ZCM-FT-52-2021	ZCM-FT-52	200651115
53	Pesticiden	A-1155	Zonnebloemzaad cooked material	**Zonnebloemzaad cooked material Volgnummer: 53 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad cooked material Monsternummer: ZCM-FT-53-2021 Opslagcondities: < - 18°C en donker**	ZCM-FT-53-2021	ZCM-FT-53	200651116

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
54	Pesticiden	A-1155	Zonnebloemzaad cooked material	**Zonnebloemzaad cooked material Volgnummer: 54 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad cooked material Monsternummer: ZCM-FT-54-2021 Opslagcondities: < - 18°C en donker**	ZCM-FT-54-2021	ZCM-FT-54	200651117
55	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloemzaad press cake	**Zonnebloemzaad press cake Volgnummer: 55 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad press cake Monsternummer: ZPC-FT-55-2021 Opslagcondities: < - 18°C en donker**	ZPC-FT-55-2021	ZPC-FT-55	200651118
56	Pesticiden	A-1155	Zonnebloemzaad press cake	**Zonnebloemzaad press cake Volgnummer: 56 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad press cake Monsternummer: ZPC-FT-56-2021 Opslagcondities: < - 18°C en donker**	ZPC-FT-56-2021 (aangetroffen: 40-TO)	ZPC-FT-56	200651119
57	Pesticiden	A-1155	Zonnebloemzaad press cake	**Zonnebloemzaad press cake Volgnummer: 57 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad press cake Monsternummer: ZPC-FT-57-2021 Opslagcondities: < - 18°C en donker**	ZPC-FT-57-2021	ZPC-FT-57	200651120
58	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloem white flakes	**Zonnebloemzaad white flakes Volgnummer: 58 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad white flakes Monsternummer: ZWF-FT-58-2021 Opslagcondities: < - 18°C en donker**	ZWF-FT-58-2021	ZWF-FT-58	200651121

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
59	Pesticiden	A-1155	Zonnebloem white flakes	**Zonnebloemzaad white flakes Volgnummer: 59 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad white flakes Monsternummer: ZWF-FT-59-2021 Opslagcondities: < - 18°C en donker**	ZWF-FT-59-2021	ZWF-FT-59	200651122
60	Pesticiden	A-1155	Zonnebloem white flakes	**Zonnebloemzaad white flakes Volgnummer: 60 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad white flakes Monsternummer: ZWF-FT-60-2021 Opslagcondities: < - 18°C en donker**	ZWF-FT-60-2021	ZWF-FT-60	200651123
61	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloem toasted meal	**Zonnebloemzaad toasted meal Volgnummer: 61 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad toasted meal Monsternummer: ZTM-FT-61-2021 Opslagcondities: < - 18°C en donker**	ZTM-FT-61-2021	ZTM-FT-61	200651124
62	Pesticiden	A-1155	Zonnebloem toasted meal	**Zonnebloemzaad toasted meal Volgnummer: 62 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad toasted meal Monsternummer: ZTM-FT-62-2021 Opslagcondities: < - 18°C en donker**	ZTM-FT-62-2021 (aangetroffen: 80-TO)	ZTM-FT-62	200651125
63	Pesticiden	A-1155	Zonnebloem toasted meal	**Zonnebloemzaad toasted meal Volgnummer: 63 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad toasted meal Monsternummer: ZTM-FT-63-2021 Opslagcondities: < - 18°C en donker**	ZTM-FT-63-2021	ZTM-FT-63	200651126

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
64	Pesticiden Vet&Vocht	A-1155 A-0732 N-0272	Zonnebloem oil extracted	**Zonnebloemzaad oil extracted Volgnummer: 64 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil extracted Monsternummer: ZOE-FT-64-2021 Opslagcondities: < - 18°C en donker**	ZOE-FT-64-2021	ZOE-FT-64	200651127
65	Pesticiden	A-1155	Zonnebloem oil extracted	**Zonnebloemzaad oil extracted Volgnummer: 65 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil extracted Monsternummer: ZOE-FT-65-2021 Opslagcondities: < - 18°C en donker**	ZOE-FT-65-2021	ZOE-FT-65	200651128
66	Pesticiden	A-1155	Zonnebloem oil extracted	**Zonnebloemzaad oil extracted Volgnummer: 66 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil extracted Monsternummer: ZOE-FT-66-2021 Opslagcondities: < - 18°C en donker**	ZOE-FT-66-2021	ZOE-FT-66	200651129
67	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Zonnebloem oil pressed	**Zonnebloemzaad oil pressed Volgnummer: 67 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil pressed Monsternummer: ZOP-FT-67-2021 Opslagcondities: < - 18°C en donker**	ZOP-FT-67-2021	ZOP-FT-67	200651130
68	Pesticiden	A-1155	Zonnebloem oil pressed	**Zonnebloemzaad oil pressed Volgnummer: 68 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil pressed Monsternummer: ZOP-FT-68-2021 Opslagcondities: < - 18°C en donker**	ZOP-FT-68-2021	ZOP-FT-68	200651131

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
69	Pesticiden	A-1155	Zonnebloem oil pressed	**Zonnebloemzaad oil pressed Volgnummer: 69 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil pressed Monsternummer: ZOP-FT-69-2021 Opslagcondities: < - 18°C en donker**	ZOP-FT-69-2021	ZOP-FT-69	200651132
70	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Zonnebloem oil mixed	**Zonnebloemzaad oil mixed Volgnummer: 70 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil mixed Monsternummer: ZOM-FT-70-2021 Opslagcondities: < - 18°C en donker**	ZOM-FT-70-2021	ZOM-FT-70	200651133
71	Pesticiden	A-1155	Zonnebloem oil mixed	**Zonnebloemzaad oil mixed Volgnummer: 71 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil mixed Monsternummer: ZOM-FT-71-2021 Opslagcondities: < - 18°C en donker**	ZOM-FT-71-2021	ZOM-FT-71	200651134
72	Pesticiden	A-1155	Zonnebloem oil mixed	**Zonnebloemzaad oil mixed Volgnummer: 72 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloemzaad oil mixed Monsternummer: ZOM-FT-72-2021 Opslagcondities: < - 18°C en donker**	ZOM-FT-72-2021	ZOM-FT-72	200651135
73	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Raapzaad oil mixed	**Raapzaad oil mixed Volgnummer: 73 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil mixed Monsternummer: ROM-FT-73-2021 Opslagcondities: < - 18°C en donker**	ROM-FT-73-2021	ROM-FT-73	200651136

							Monsteradministratie WFSR
Volgnr.	**Analyse**	**SOP**	**Naam in LIMS**	**Samenstelling monster**	**Monstercode/label**		**RIKILT monsternummer**
74	Pesticiden	A-1155	Raapzaad oil mixed	**Raapzaad oil mixed Volgnummer: 74 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil mixed Monsternummer: ROM-FT-74-2021 Opslagcondities: < - 18°C en donker**	ROM-FT-74-2021	ROM-FT-74	200651137
75	Pesticiden	A-1155	Raapzaad oil mixed	**Raapzaad oil mixed Volgnummer: 75 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad oil mixed Monsternummer: ROM-FT-75-2021 Opslagcondities: < - 18°C en donker**	ROM-FT-75-2021	ROM-FT-75	200651138
76	Opslag		Soja roasted press cake	**Soja roasted press cake Volgnummer: 76 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Soja roasted press cake Monsternummer: SRPC-FT-76-2021 Opslagcondities: < - 18°C en donker**	SRPC-FT-76-2021 (aangetroffen: 140/CPTC211146910/TxSoTa)	SRPC-FT-76	200651139
77	Opslag		Raapzaad roasted press cake	**Raapzaad roasted press cake Volgnummer: 77 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Raapzaad roasted press cake Monsternummer: RRPC-FT-77-2021 Opslagcondities: < - 18°C en donker**	RRPC-FT-77-2021 (aangetroffen: 138/CPTC211146910/TxCoTa)	RRPC-FT-77	200651140
78	Opslag		Zonnebloem roasted press cake	**Zonnebloem roasted press cake Volgnummer: 78 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: december 2021 Product/fractie: Zonnebloem roasted press cake Monsternummer: ZRPC-FT-78-2021 Opslagcondities: < - 18°C en donker**	ZRPC-FT-78-2021 (aangetroffen: 139/CPTC211146910/TxToTa)	ZRPC-FT-78	200651141

Annex 3 Sample list processing ADM

Monsterlijst

Verwerkingsfactoren pesticiden in diervoeding

Projectnr: 1297380601

Veldstudie met oliezaden (Field trial oilseeds-04)

							Monsteradministratie WFSR
Volgnr.	Analyse	SOP	Naam in LIMS	Samenstelling monster	Monstercode/label	Monstercode ADM	WFSR monsternummer
79	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Rapeseedoil crude	**Rapeseedoil crude Volgnummer: 79 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CO-79-2022 Opslagcondities: < - 18°C en donker**	RO-CO-79-2022	79-RO-CO-22	**200653419**
80	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Rapeseedoil caustic washed	**Rapeseedoil caustic washed Volgnummer: 80 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CW-80-2022-1 Opslagcondities: < - 18°C en donker**	RO-CW-80-2022-1	80-RO-CW-1-22	**200653420**
81	Pesticiden	A-1155	Rapeseedoil caustic washed	**Rapeseedoil caustic washed Volgnummer: 81 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CW-81-2022-2 Opslagcondities: < - 18°C en donker**	RO-CW-81-2022-2	81-RO-CW-2-22	**200653421**
84	Pesticiden	A-1155	Rapeseedoil caustic washed - Soap	**Rapeseedoil caustic washed - Soap Volgnummer: 84 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWS-84-2022 Opslagcondities: < - 18°C en donker**	RO-CWS-84-2022	84-RO-CWS-22	**200653422**
85	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Rapeseedoil, caustic washed, bleached	**Rapeseedoil, caustic washed, bleached Volgnummer: 85 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWB-85-2022-1 Opslagcondities: < - 18°C en donker**	RO-CWB-85-2022-1	85-RO-CWB-22	**200653423**
86	Pesticiden	A-1155	Rapeseedoil, caustic washed, bleached	**Rapeseedoil, caustic washed, bleached Volgnummer: 86 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWB-86-2022-2 Opslagcondities: < - 18°C en donker**	RO-CWB-86-2022-2	86-RO-CWB-22	**200653424**
88	Pesticiden	A-1155	Rapeseedoil, caustic washed, bleached - Bleaching clay	**Rapeseedoil, caustic washed, bleached - Bleaching clay Volgnummer: 88 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWBC-88-2022 Opslagcondities: < - 18°C en donker**	RO-CWBC-88-2022	88-RO-CWBC-22	**200653425**
89	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Rapeseedoil, caustic washed, bleached, deodorized	**Rapeseedoil, caustic washed, bleached, deodorized Volgnummer: 89 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWBD-89-2022-1 Opslagcondities: < - 18°C en donker**	RO-CWBD-89-2022-1	89-RO-CWBD-1-22	**200653426**
90	Pesticiden	A-1155	Rapeseedoil, caustic washed, bleached, deodorized	**Rapeseedoil, caustic washed, bleached, deodorized Volgnummer: 90 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Raapolie Monsternummer: RO-CWBD-90-2022-2 Opslagcondities: < - 18°C en donker**	RO-CWBD-90-2022-2	90-RO-CWBD-2-22	**200653427**

92	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, caustic washed, bleached, deodorized - Fatty acid distillate	**Rapeseedoil, caustic washed, bleached, deodorized - Fatty acid distillate** **Volgnummer: 92** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-CWBDFA-92-2022** **Opslagcondities: < - 18°C en donker**	RO-CWBDFA-92-2022	92-RO-CWBDFA-22	**200653428**
93	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, degummed	**Rapeseedoil, degummed** **Volgnummer: 93** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-D-93-2022-1** **Opslagcondities: < - 18°C en donker**	RO-D-93-2022-1	93-RO-D-1-22	**200653429**
94	Pesticiden	A-1155	Rapeseedoil, degummed	**Rapeseedoil, degummed** **Volgnummer: 94** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-D-94-2022-2** **Opslagcondities: < - 18°C en donker**	RO-D-94-2022-2	94-RO-D-2-22	**200653430**
97	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, degummed - watery phase	**Rapeseedoil, degummed - watery phase** **Volgnummer: 97** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DW-97-2022** **Opslagcondities: < - 18°C en donker**	RO-DW-97-2022	97-RO-DW-22	**200653431**
98	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, degummed, bleached	**Rapeseedoil, degummed, bleached** **Volgnummer: 98** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DB-98-2022-1** **Opslagcondities: < - 18°C en donker**	RO-DB-98-2022-1	98-RO-DB-1-22	**200653432**
99	Pesticiden	A-1155	Rapeseedoil, degummed, bleached	**Rapeseedoil, degummed, bleached** **Volgnummer: 99** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DB-99-2022-2** **Opslagcondities: < - 18°C en donker**	RO-DB-99-2022-2	9-RO-DB-2-22	**200653433**
101	Pesticiden	A-1155	Rapeseedoil, degummed, bleached - Bleaching clay	**Rapeseedoil, degummed, bleached - Bleaching clay** **Volgnummer: 101** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DBC-101-2022** **Opslagcondities: < - 18°C en donker**	RO-DBC-101-2022	101-RO-DBC-22	**200653434**
102	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, degummed, bleached, deodorized	**Rapeseedoil, degummed, bleached, deodorized** **Volgnummer: 102** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DBD-102-2022-1** **Opslagcondities: < - 18°C en donker**	RO-DBD-102-2022-1	102-RO-DBD-1-22	**200653435**
105	Pesticiden	A-1155 A-0732 N-0417	Rapeseedoil, degummed, bleached, deodorized - fatty acid distillate	**Rapeseedoil, degummed, bleached, deodorized - fatty acid distillate** **Volgnummer: 105** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Raapolie** **Monsternummer: RO-DBDFA-105-2022** **Opslagcondities: < - 18°C en donker**	RO-DBDFA-105-2022	105-RO-DBDFA-22	**200653437**
106	Pesticiden	A-1155 A-0732 N-0417	Sunflowerseed oil crude	**Sunflowerseedoil crude** **Volgnummer: 106** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Zonnebloemolie** **Monsternummer: SO-CO-106-2022** **Opslagcondities: < - 18°C en donker**	SO-CO-106-2022	106-SO-CO-22	**200653438**
107	Pesticiden	A-1155 A-0732 N-0417	Sunfloweroil, caustic washed	**Sunfloweroil, caustic washed** **Volgnummer: 107** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Zonnebloemolie** **Monsternummer: SO-CW-107-2022-1** **Opslagcondities: < - 18°C en donker**	SO-CW-107-2022-1	107-SO-CW-1-22	**200653439**
108	Pesticiden	A-1155	Sunfloweroil, caustic washed	**Sunfloweroil, caustic washed** **Volgnummer: 108** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Zonnebloemolie** **Monsternummer: SO-CW-108-2022-2** **Opslagcondities: < - 18°C en donker**	SO-CW-108-2022-2	108-SO-CW-2-22	**200653440**
111	Pesticiden	A-1155	Sunfloweroil, caustic washed - soap	**Sunfloweroil, caustic washed - soap** **Volgnummer: 111** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Zonnebloemolie** **Monsternummer: SO-CWS-111-2022** **Opslagcondities: < - 18°C en donker**	SO-CWS-111-2022	111-SO-CWS-22	**200653441**
112	Pesticiden	A-1155 A-0732 N-0417	Sunfloweroil, caustic washed, bleached	**Sunfloweroil, caustic washed, bleached** **Volgnummer: 112** **Type studie: Field oilseeds-05** **WFSR projectnummer: 1297380601** **Datum monstername: januari 2022** **Product/fractie: Zonnebloemolie** **Monsternummer: SO-CWB-112-2022-1** **Opslagcondities: < - 18°C en donker**	SO-CWB-112-2022-1	112-SO-CWB-1-22	**200653436**

113	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, caustic washed, bleached	**Sunfloweroil, caustic washed, bleached Volgnummer: 113 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-CWB-113-2022-2 Opslagcondities: < - 18°C en donker**	SO-CWB-113-2022-2	113-SO-CWB-2-22	**200653442**
115	Pesticiden	A-1155	Sunfloweroil, caustic washed, bleached - bleaching clay	**Sunfloweroil, caustic washed, bleached - bleaching clay Volgnummer: 115 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-CWBC-115-2022 Opslagcondities: < - 18°C en donker**	SO-CWBC-115-2022	115-SO-CWBC-22	**200653443**
116	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, caustic washed, bleached, deodorized	**Sunfloweroil, caustic washed, bleached, deodorized Volgnummer: 116 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-CWBD-116-2022-1 Opslagcondities: < - 18°C en donker**	SO-CWBD-116-2022-1	116-SO-CWBD-1-22	**200653444**
117	Pesticiden	A-1155	Sunfloweroil, caustic washed, bleached, deodorized	**Sunfloweroil, caustic washed, bleached, deodorized Volgnummer: 117 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-CWBD-117-2022-2 Opslagcondities: < - 18°C en donker**	SO-CWBD-117-2022-2	117-SO-CWBD-2-22	**200653445**
119	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, caustic washed, bleached, deodorized - fatty acid distillate	**Sunfloweroil, caustic washed, bleached, deodorized - fatty acid distillate Volgnummer: 119 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-CWBDFA-119-2022 Opslagcondities: < - 18°C en donker**	SO-CWBDFA-119-2022	119-SO-CWBDFA-22	**200653446**
120	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, degummed	**Sunfloweroil, degummed Volgnummer: 120 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-D-120-2022-1 Opslagcondities: < - 18°C en donker**	SO-D-120-2022-1	120-SO-D-1-22	**200653447**
121	Pesticiden	A-1155	Sunfloweroil, degummed	**Sunfloweroil, degummed Volgnummer: 121 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-D-121-2022-2 Opslagcondities: < - 18°C en donker**	SO-D-121-2022-2	121-SO-D-2-22	**200653448**
123	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, degummed - watery phase	**Sunfloweroil, degummed - watery phase Volgnummer: 123 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DW-123-2022 Opslagcondities: < - 18°C en donker**	SO-DW-123-2022	123-SO-DW-22	**200653449**
124	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, degummed, bleached	**Sunfloweroil, degummed, bleached Volgnummer: 124 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DB-124-2022-1 Opslagcondities: < - 18°C en donker**	SO-DB-124-2022-1	124-SO-DB-1-22	**200653450**
125	Pesticiden	A-1155	Sunfloweroil, degummed, bleached	**Sunfloweroil, degummed, bleached Volgnummer: 125 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DB-125-2022-2 Opslagcondities: < - 18°C en donker**	SO-DB-125-2022-2	125-SO-DB-2-22	**200653451**
127	Pesticiden	A-1155	Sunfloweroil, degummed, bleached - bleaching clay	**Sunfloweroil, degummed, bleached - bleaching clay Volgnummer: 127 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DBC-127-2022 Opslagcondities: < - 18°C en donker**	SO-DBC-127-2022	127-SO-DBC-22	**200653452**
128	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, degummed, bleached, deodorized	**Sunfloweroil, degummed, bleached, deodorized Volgnummer: 128 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DBD-128-2022-1 Opslagcondities: < - 18°C en donker**	SO-DBD-128-2022-1	128-SO-DBD-1-22	**200653453**
129	Pesticiden	A-1155	Sunfloweroil, degummed, bleached, deodorized	**Sunfloweroil, degummed, bleached, deodorized Volgnummer: 129 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DBD-129-2022-2 Opslagcondities: < - 18°C en donker**	SO-DBD-129-2022-2	129-SO-DBD-2-22	**200653454**
131	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Sunfloweroil, degummed, bleached, deodorized - fatty acid distillate	**Sunfloweroil, degummed, bleached, deodorized - fatty acid distillate Volgnummer: 131 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Zonnebloemolie Monsternummer: SO-DBDFA-131-2022 Opslagcondities: < - 18°C en donker**	SO-DBDFA-131-2022	131-SO-DBDFA-22	**200653455**
132	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil crude oil	**Soybeanoil crude Volgnummer: 132 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-CO-132-2022 Opslagcondities: < - 18°C en donker**	SBO-CO-132-2022	132-SBO-CO-22	**200653456**

133	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil, degummed	**Soybeanoil, degummed Volgnummer: 133 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-D-133-2022-1 Opslagcondities: < - 18°C en donker**	SBO-D-133-2022-1	133-SBO-D-1-22	**200653457**
134	Pesticiden	A-1155	Soybeanoil, degummed	**Soybeanoil, degummed Volgnummer: 134 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-D-134-2022-2 Opslagcondities: < - 18°C en donker**	SBO-D-134-2022-2	134-SBO-D-2-22	**200653458**
139	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil, degummed - watery phase	**Soybeanoil, degummed - watery phase Volgnummer: 139 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DW-139-2022 Opslagcondities: < - 18°C en donker**	SBO-DW-139-2022	139-SBO-DW-22	**200653459**
140	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil, degummed, bleached	**Soybeanoil, degummed, bleached Volgnummer: 140 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DB-140-2022-1 Opslagcondities: < - 18°C en donker**	SBO-DB-140-2022-1	140-SBO-DB-1-22	**200653460**
141	Pesticiden	A-1155	Soybeanoil, degummed, bleached	**Soybeanoil, degummed, bleached Volgnummer: 141 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DB-141-2022-2 Opslagcondities: < - 18°C en donker**	SBO-DB-141-2022-2	141-SBO-DB-2-22	**200653461**
148	Pesticiden	A-1155	Soybeanoil, degummed, bleached - bleaching clay	**Soybeanoil, degummed, bleached - bleaching clay Volgnummer: 148 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DBC-148-2022 Opslagcondities: < - 18°C en donker**	SBO-DBC-148-2022	148-SBO-DBC-22	**200653462**
149	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil, degummed, bleached, deodorized	**Soybeanoil, degummed, bleached, deodorized Volgnummer: 149 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DBD-149-2022-1 Opslagcondities: < - 18°C en donker**	SBO-DBD-149-2022-1	149-SBO-DBD-1-22	**200653463**
150	Pesticiden	A-1155	Soybeanoil, degummed, bleached, deodorized	**Soybeanoil, degummed, bleached, deodorized Volgnummer: 150 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DBD-150-2022-2 Opslagcondities: < - 18°C en donker**	SBO-DBD-150-2022-2	150-SBO-DBD-2-22	**200653464**
152	Pesticiden Vet&Vocht	A-1155 A-0732 N-0417	Soybeanoil, degummed, bleached, deodorized - fatty acid distillate	**Soybeanoil, degummed, bleached, deodorized - fatty acid distillate Volgnummer: 152 Type studie: Field oilseeds-05 WFSR projectnummer: 1297380601 Datum monstername: januari 2022 Product/fractie: Sojaolie Monsternummer: SBO-DBDFA-152-2022 Opslagcondities: < - 18°C en donker**	SBO-DBDFA-152-2022	152-SBO-DBDFA-22	**200653465**

Annex 4 ITERG Report - Oilseed crushing

ITERG	**Trial report**
Date : 06/12/2021	Editor : JP Loison

Trial : CPTC211146910 : Study of the active material factors transfer during the trituration.

Objectives :

The objective was to carry out a complete trituration process on 3 products (rapeseed, soybean and sunflower) doped with pesticides. The objective was to quantify the transfer of these molecules throughout the process. Sample of final oil and cake as well as each product after each step of the process were taken for analysis.

Summary :

I- Raw material :

Table 1 : Characteristic and identification of each product

Product	Quantity (Kg)	Identification ITERG
sunflowers seeds	100	**139/TO/21**
Rapeseed seeds	100	**138/CO/21**
Soya seeds	100	**140/SO/21**

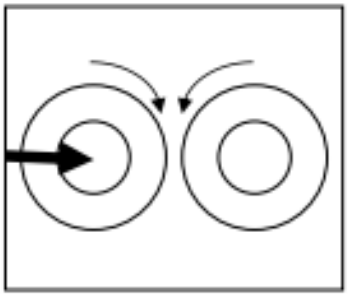
II- Material:

Table 2 : Material list

Flaker Bühler
Horizontal cooker
OLEANE Press
Extractor 6L
Büchner
Reboiler pilot

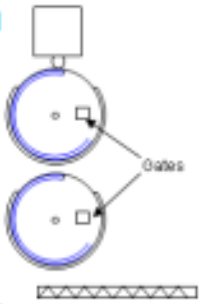
- **Flaker Bühler :**

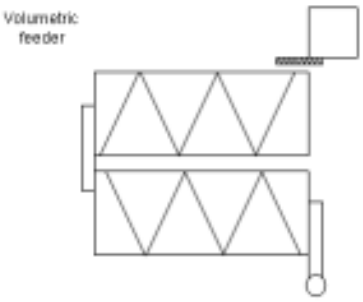
Seeds or cracked seeds are flaked by passing through two contra-rotating smooth cylinders of 500 mm in diameter. The space between the cylinders can be adjusted and a couple of hydraulic jacks hold the mobile cylinder against the still one.



- **Horizontal cooker** (La Mécanique Moderne).

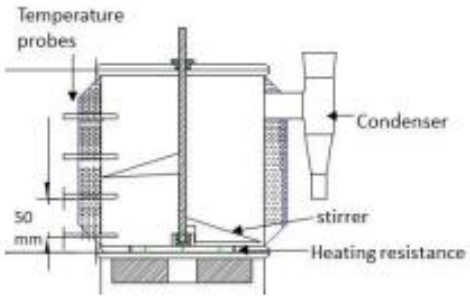
This cooker is made up of two superposed horizontal cylinders of 900 mm in diameter and 2000 mm in length. The walls of these cookers are heated by a thermal fluid heated itself by 4 electrical resistances of 4 kW and circulated by a centrifugal pump. The convection of heat in the material is forced by continuous stirring provided by a helical ribbon. The feeding of the upper cylinder is provided by a volumetric feeder fitted with an anti-bridging agitator. The discharge is operated by sliding gates located on the extremity of the cylinders at half height. These gates are commanded by a detector located in the hopper of the discharging screw. As soon as the detector is covered, the gates are closed and reciprocally they are opened when the material in the hopper disappears. Residence time can be adjusted from 20 to 240 mn and temperature from 20 to 110°C. The second stage is connected to a fan that can extract the mist steaming from the drying material. One can send water or steam to control the final moisture of the cooked product.





- **Bench cooker**

The bench-cooker is composed by a stainless-steel vessel, insulated and heated by a 1000 W resistance. The capacity is around 2 kg of powder. The matter is homogenized by blades rotating stirrer. A refrigerant connected to the cover allows to condensate the steam leaving the vessel. Four temperature probes are set at different heights in the heat chamber and connected to a computer. The heating is controlled by the voltage.



- **OLEANE Press**

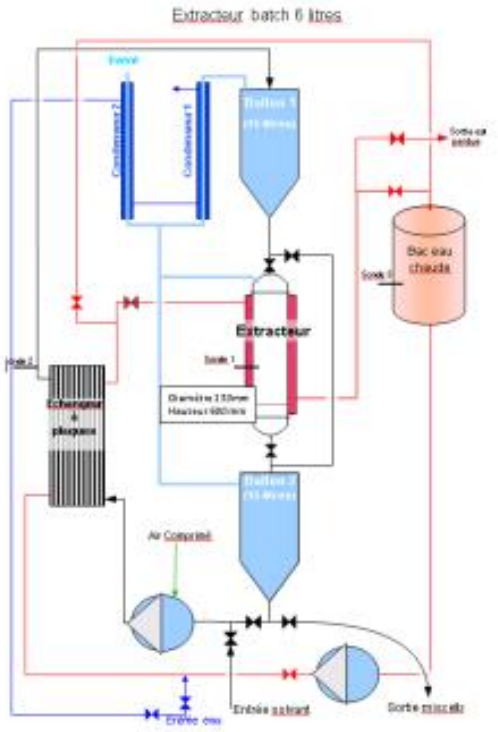
The input material capacity is estimated as 15-30 kg/h. The power of the electric motor is 2.2 kW and its rotating speed is adjustable thanks to a frequency variator. The screw profile has been modified in house to enhance the press capacity.

- **Oil filtration by Büchner**

Lab scale filtration is performed under vacuum on a Büchner. The filter paper has a porosity of 5-13 µm.

- **Extractor 6L**

The extractor is equivalent to one extraction stage. It includes an extraction chamber of 6 L, a pump and a heat exchanger to regulate the solvent temperature (Figure 5). The extraction chamber is insulated and heated with steam through a double jacked. The bottom is a perforated grill allowing the liquid flow. The extraction is carried out by solvent percolation on the matter for a fixed time and temperature. The pump allows the recirculation of the miscella on the extracting matter.



- **Miscella distillation**

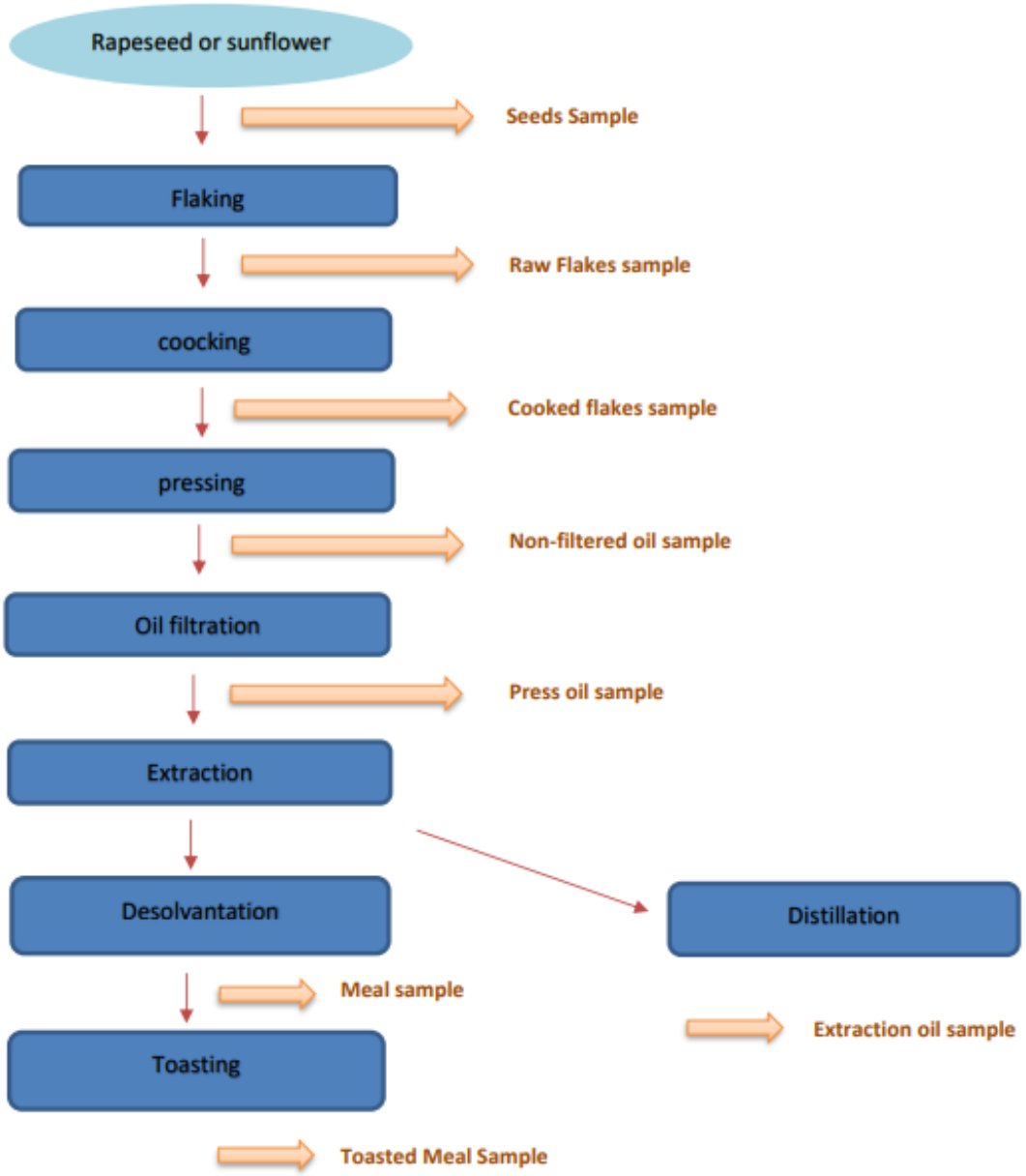
The solvent is removed from the miscella in a reboiler-pilot of 50 L.

The 50L-reboiler is sat on the top by a distillation column (Figure 6). The heat is provided by an electrical resistance inside the reboiler. A heat exchanger at the top of the column condenses the solvent vapors. The solvent is then stored in a tank. The system works under a vacuum of -0.5 to -0.9 bar to decrease the boil temperature of the solvent. The distillation temperature is not higher than 75°C. The end of the distillation step is determined by an increase of the temperature in the reboiler. At the end, some steam is injected in the reboiler to remove the residual solvent vapor.

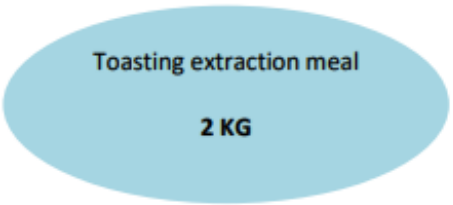
III- Realisation :

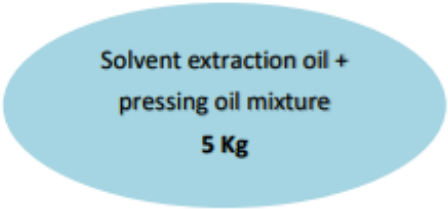
III-1- General process :

III-1-1- Rapeseed and sunflower

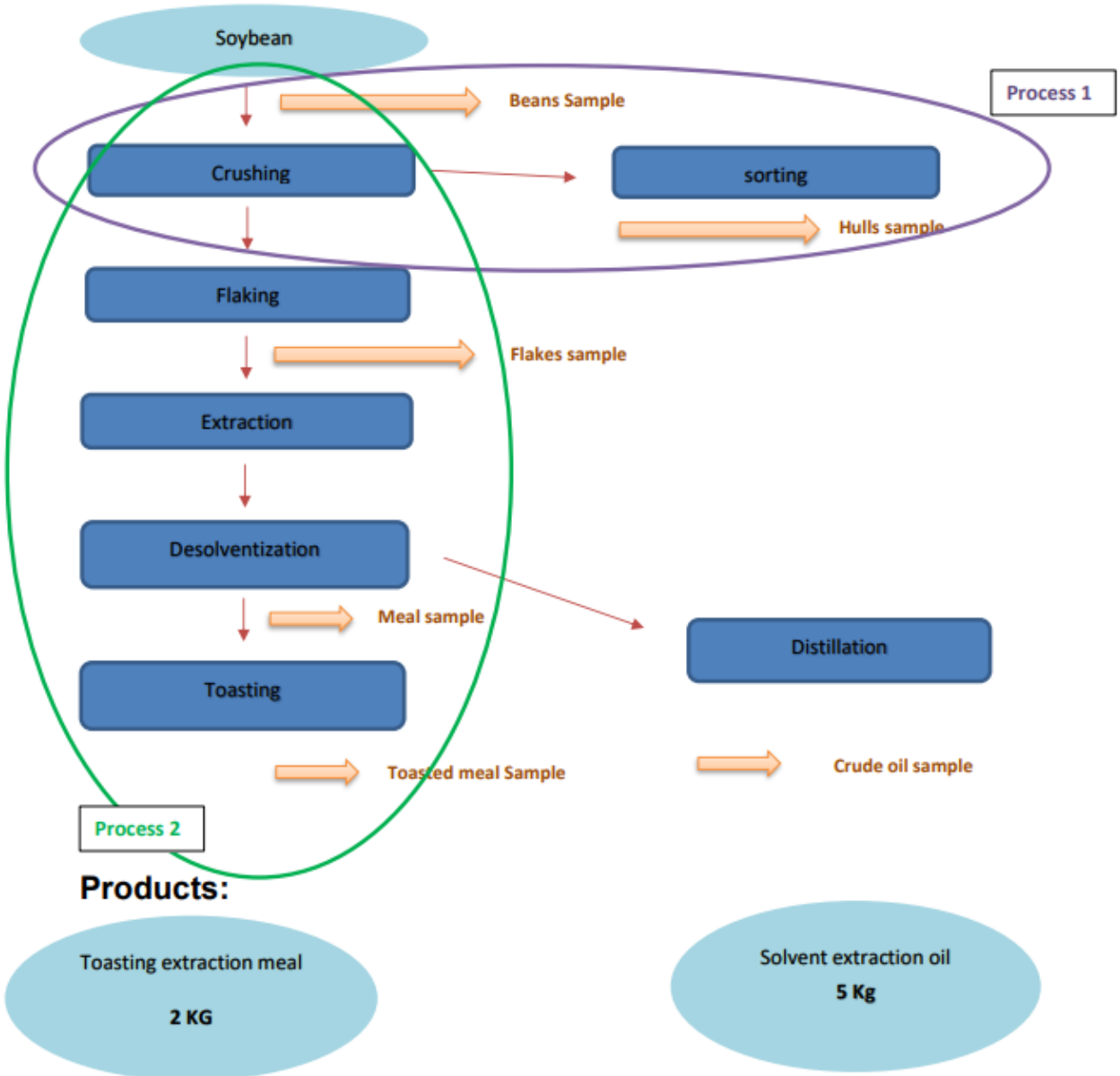


Products:





III-1-2- Soybean



III-2- Process :

III-2-1- Sunflower and rapeseed: Flacking :

For rapeseed and sunflower seeds, a preliminary flacking took place to promote subsequent cooking. The objective of this step was to obtain a product without whole seed after passing between the rollers. Table 3 shows the mass balance for this step.

Tableau3 : Flacking material balance

Product	Start mass (Kg)	Final mass (Kg)	Mass loss (Kg)
Sunflower	70,0	69,0	1.0
Rapeseed	70,0	68,8	1,2

III-2-2- Sunflower and rapeseed: cooking and pressing

A preliminary cooking was carried out for the rapeseed and sunflower seeds before pressing. This cooking lasted 30 minutes at a seed temperature of 90 °C. After cooking, the seeds were directly sent to the press. The objective of the pressing was to achieve a fat content of around 20% in the press cake and obtain a product allowing a quality extraction thereafter.

Table 4 : cooking and pressing record for sunflower

Date	hour	Oil flow (Kg/h)	Cake flow (Kg/h)	T°C cake (°C)	T°C press (°C)	Engine power (kw)	Thickness cake (mm)	Oil content (%)	Rotation speed (Hz)
23/11	11 :25	18,5	17,5	137,5	132,6	1,2	2,2	17,0	50
	11 :55	10,0	15,0	130,4	126,8	1,3	2,2	24,6	50

Remark : A large amount of pressure feet were produced during pressing, impacting in particular the oil flow.

Table 5 : cooking and pressing record for rapeseed

Date	hour	Oil flow (Kg/h)	Cake flow (Kg/h)	T°C cake (°C)	T°C press (°C)	Engine power (kw)	Thickness cake (mm)	Oil content (%)	Rotation speed (Hz)
24/11	10:00	9,0	10,5	96,2	90,2	0,73	2,1	22,3	35,6
	10:45	9,5	11,0	100,3	98,4	0,75	1,4	17,3	42,3

Remark : A large amount of pressure feet were produced during pressing, impacting in particular the oil flow.

Mass balance :

Table 6 : mass balance

	Sunflower	Rapeseed
Cooking		
Mass before cooking	69,0	68,8
Mass after cooking	61,0	60,0
Pressing		
Mass crude oil	*	16,2
Mass conform cake	16.5	19,2
Mass feet press	*	6,3
Mass non conform cake	12,5	12,7
Mass loss	-	5,6

Remark : the significant losses are explained by the time required to reach the target for residual oil content in the pressure cake.

* In the case of the sunflower, the pressure feet had reabsorbed the oil. This was due to the very large amount of pressure feet produced. It was not possible to weight the pressure feet and the crude oil.

III-2-3- Sunflower, rapeseed and soybean : solvent extraction

The capacity of the extractor being limited to 6L, the cake was divided in several sub-batches for the solvent extraction.

For sunflower and rapeseed, 4 extraction batches were required to produce the quantity of extraction oil initially expected (approximately 1.5 Kg of solvent extraction oil).

For soybean, it was necessary to carry out 11 extraction batches to produce the quantity of extraction oil initially expected (approximately 5 Kg of solvent extraction oil).

Tables 7, 8 and 9 show the main notations carried out during this step.

Table 7 : sunflower solvent extraction

Batch number	Mass press cake (g)	Average extraction temperature (°C)	Duration wash (min)	Number of washes
1	4000	52.1	10	6
2	4000	51,8	10	6
3	4000	51,4	10	6
4	4000	51,4	10	6

Table 8 : rapeseed solvent extraction

Batch number	Mass press cake (g)	Average extraction temperature (°C)	Duration wash (min)	Number of washes
1	4000	53,0	10	5
2	4000	52,8	10	5
3	4000	52,1	10	6
4	4000	52,0	10	5

Table 9 : soybean solvent extraction

Batch number	Mass press cake (g)	Average extraction temperature (°C)	Duration wash (min)	Number of washes
1	3500	52,2	10	5
2	3500	52,6	10	5
3	3500	52,6	10	5
4	3500	51,7	10	5
5	3500	52,1	10	5
6	3500	52,9	10	5
7	3500	52,4	10	5
8	3500	51,7	10	5
9	3500	52,3	10	5
10	3500	51,8	10	5
11	3500	51,7	10	5

III-2-4- Sunflower, rapeseed and soybean: toasting

After extraction and desolventization, the cakes were toasted in the bench cooker. Two operations for each meal were necessary to perform this processing step. The cooking time was set at 45 minutes once temperature reached 100°C Water was added to the white flakes when their temperature reached 100°C. This addition of water was intended to produce steam and limit the toasting temperature in order to reproduce the moist conditions present in the industrial desolventizer-toaster.

Table 10 : toasting records

	Sunflower		rapeseed		Soybean	
Date	30/11/2&		01/12/21		02/12:21	
Mass introduced (g)	2105	2100	2145	2080	2140	2100
Starting time	13:18	14:35	13:50	15:07	10:50	14:32
Temperature when water was introduced (°C)	99,8	99,7	100,1	100,3	100,4	100,2
Mass of water (g)	150	150	150	150	150	150
Stop time	14:03	15:20	14:35	15:52	11:35	15:17
Final temperature (°C)	106.4	105,6	107,4	107,6	107,4	107,1
Initial water content (%)	4,2		7,5		11,05	
Final water content (%)	6,8		8,3		13,8	

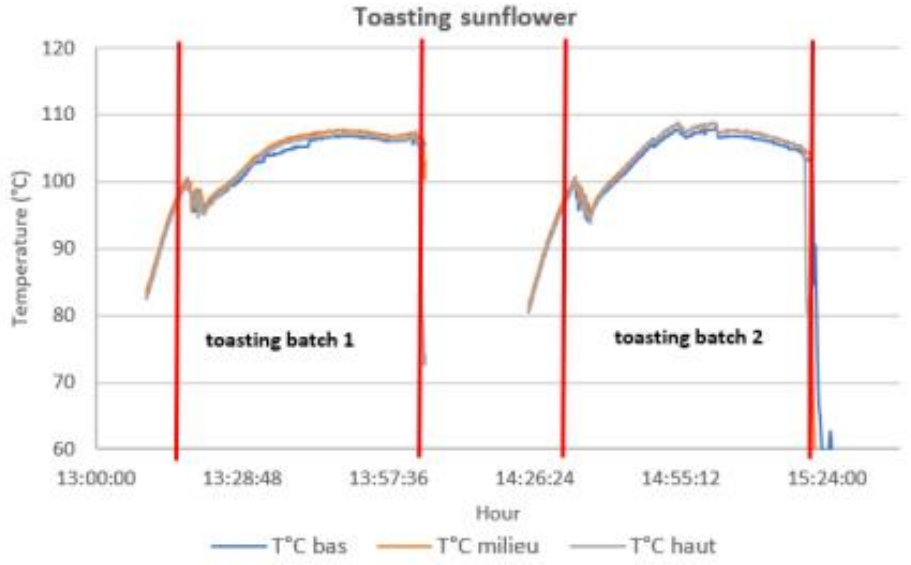


Fig. 1 : Sunflower toasting record

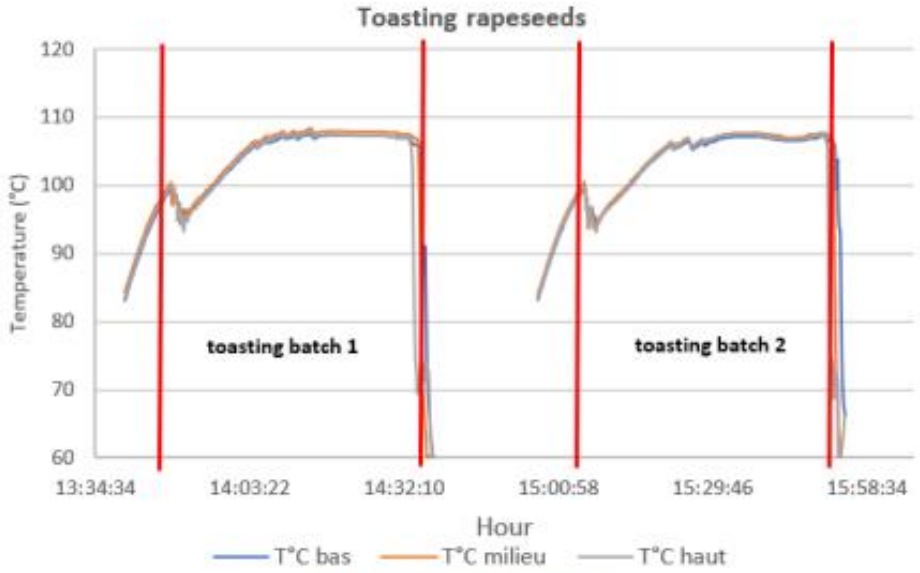


Fig 2 : Rapeseed toasting record

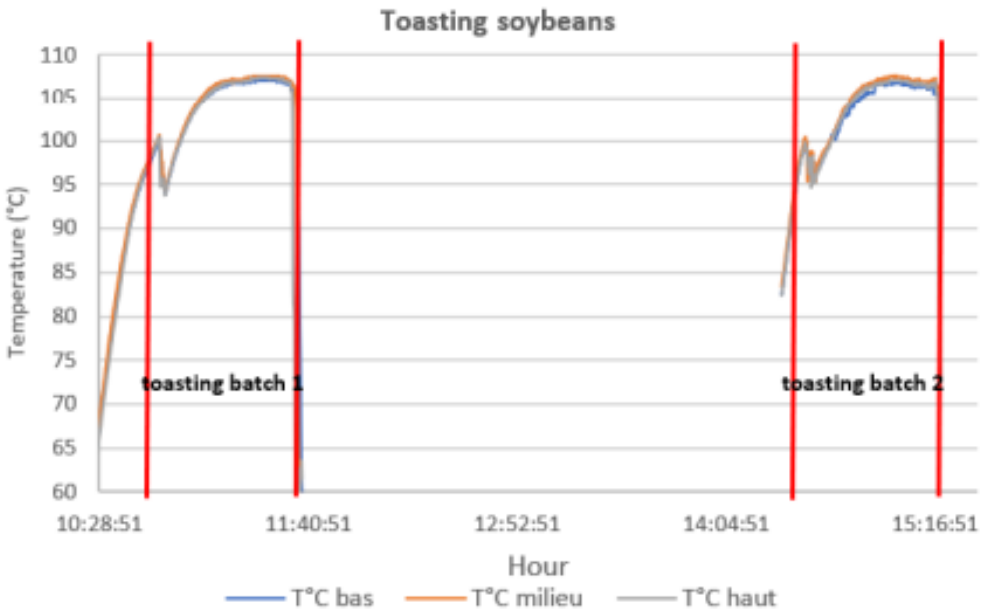


Fig 3 : soybean toasting record

III-2-4- Sunflower and rapeseed oil mixture :

For sunflower and rapeseed, the press oil and the solvent extracted oil were mixed. A ratio between the amount of pressure oil and solvent extraction oil was observed. The table 11 shows the masses of oil which have been added.

Table 11 : mixture

Rapeseed		Sunflower	
Pressing oil	**Solvent extraction oil**	**Pressing oil**	**Solvent extraction oil**
3.75 Kg	1.25 Kg	3.75 Kg	1.25 Kg

IV- Analysis :

Product	Dry matter (%)	Oil content (%/as it)
Rapeseed seeds	93,7	47,6
Soybean seeds	90,8	20,6
Sunflower seeds	93,9	43,5
Rapeseed press cake	95,9	19,9
Sunflower press cake	99,6	21,8
Sunflower extraction meal	94,4	0,5
Soybean extraction meal	89,1	5,9
Rapeseed extraction meal	92,7	1,6

Assumption high value residual oil soybean :

During extractions, the dry matter content of the miscellas in the fifth wash was less than 0.5%. This result shows that the extractable oil was removed during the extractions. The delipidation curve during the 5 washes was similar for the 11 batches carried out.

The hypothesis that can explain this poor de-oiling during soybean extractions is a grinding defect during the preparation of grains for extraction resulting in a significant non-extractible oil content. The flaking step did not adequately prepare the soybean for solvent extraction. Thus, the hexane could not properly penetrate the flaked fractions and extract all the oil present.

V- Sample :

All samples have been ship to this adress :

Wageningen Food Safety Research
Akkermaalsbos 2
Building 123
6708 WB Wageningen
The Netherlands

Libellé Produit	Code Identification	Conditionnement (nombre + type)	Poids Total
Graines de tournesol	10-TO	3 sachets plastique de 300 g	900 g
Flocons de tournesol	20-TO	3 sachets plastique de 300 g	900 g
Flocons cuits de	30-TO	3 sachets plastique de 300 g	900 g
Ecailles de pression de tournesol	40-TO	3 sachets plastique de 300 g	900 g
Huile de pression de	50-TO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction de tournesol	60-TO	3 sachets plastique de 300 g	900 g
Huile d'extraction de	70-TO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction toastés de tournesol	80-TO	3 sachets plastique de 300 g	900 g
Mélange huile pression et extraction	90-TO	3 sachets plastique de 300 g	900 g
Graines de colza dopées	11-CO	3 sachets plastique de 300 g	900 g
Flocons de colza	21-CO	3 sachets plastique de 300 g	900 g
Flocons cuits de colza	31-CO	3 sachets plastique de 300 g	900 g
Ecailles de pression de	41-CO	3 sachets plastique de 300 g	900 g
Huile de pression de	51-CO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction de colza	61-CO	3 sachets plastique de 300 g	900 g
Huile d'extraction de	71-CO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction toastés de colza	81-CO	3 sachets plastique de 300 g	900 g
Mélange huile pression et extraction	91-CO	3 sachets plastique de 300 g	900 g
Graines de soja dopées	12-SO	3 sachets plastique de 300 g	900 g
Amandes de soja	102-SO	3 sachets plastique de 300 g	900 g
Pellicules de soja	112-SO	3 sachets plastique de 300 g	900 g
Flocons de soja	22-SO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction	62-SO	3 sachets plastique de 300 g	900 g
Huile d'extraction de soja	72-SO	3 sachets plastique de 300 g	900 g
Tourteaux d'extraction toasté de soja	82-SO	3 sachets plastique de 300 g	900 g
Tourteaux de soja toastés	140/CPTC211146910/ TxSoTa	2 sachets plastique de 1Kg	2 Kg
Tourteaux de tournesol toastés	139/CPTC211146910/ TxToTa	2 sachets plastique de 1Kg	2 Kg
Tourteaux de colza toastés	138/CPTC211146910/ TxCoTa	2 sachets plastique de 1Kg	2 Kg

VI- Product :

Oil have been ship to this adress :

ADM Research GmbH
Food Lab, Att.: Julian Behnke
Seehafenstrasse 24
21079 Hamburg
Allemagne

Libellé Produit	Code Identification	Conditionnement (nombre + type)	Poids Total
Mélange huile de pression et extraction tournesol	**139/CPTC211146910/huToTa**	2 bidons de 2,5 Kg	5 Kg
Mélange huile de pression et extraction colza	**138/CPTC211146910/huCoTa**	2 bidons de 2,5 Kg	5 Kg
Huile d'extraction de soja	**140/CPTC211146910/huSoTa**	2 bidons de 2,5 Kg	5 Kg

Annex 5 ADM Report – Oil refining

Oil used	Rapeseedoil	Rapeseedoil	Sunflowerseed oil	Sunflowerseed oil	Soybean oil
Caustic washing					
Amount of Oil [g]	2500	---	2500	---	---
Temperature [°C]	70	---	70	---	---
Time [min]	20	---	20	---	---
concentration of NaOH	20%	---	20%	---	---
Amount of NaOH [%]	calculated on FFA + 10%	---	calculated on FFA + 10%	---	---
Centrifuge?	yes	---	yes	---	---
samples	300g Soapstock + 300g Oil	---	300g Soapstock + 300g Oil	---	---
Degumming					
Amount of Oil [g]	---	2500	---	2500	5000
Temperature [°C]	---	70	---	70	70
Amount of citric acid [%]	---	1.5	---	1.5	1.5
concentration of citric acid [%]		10		10	10
Time [min]	---	20	---	20	20
Centrifuge	---	yes	---	yes	yes
samples	---	300g watery phase + 300g oil	---	300g watery phase + 300g oil	300g watery phase + 300g oil
Bleaching					
Amount of Oil [%]	2000	2000	2000	2000	4500
Temperature [°C]	90	90	90	90	90
Vacuum [mbar]	80	80	80	80	80
Time [min]	30	30	30	30	30
Amount of Bleaching Clay [%]	1	1	1	1	1
Type of Bleaching Clay	Tonsil 212 FF	Tonsil 212 FF	Tonsil 212 FF	Tonsil 212 FF	Tonsil 212 FF
samples	used bleaching clay + 300g oil	used bleaching clay + 300g oil	used bleaching clay + 300g oil	used bleaching clay + 300g oil	used bleaching clay + 300g oil
Deodorization					
Amount of Oil [g]	1200	1200	1200	1200	3600
Temperature [°C]	220	220	220	220	220
Time [h]	3	3	3	3	3
Vacuum [mbar]	<1	<1	<1	<1	<1
Samples	fatty acid distillate + refined oil	fatty acid distillate + refined oil	fatty acid distillate + refined oil	fatty acid distillate + refined oil	fatty acid distillate + refined oil

Refining of field study samples of rapeseed oil, sunflowerseed oil and soybean oil by ADM, Germany.

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WFSR Report 2023.016

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