FORMULATION DES ALIMENTS COMPLETS POUR L'AQUACULTURE

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Content

1. Introduction
2. Nutrition aquacole: opportunités et défis
3. Besoins nutritionnels des poissons
4. Bases de données
5. Formulation des aliments pour poissons
6. Préparation des aliments
7. Alimentation des poissons

1. Introduction




La nutrition aquacole est maintenant bien établie comme une spécialité en sciences aquacoles: Il y a même un journal spécifique portant sur ce sujet: *Aquaculture Nutrition*

Dr. Roy Palmer: “un scientifique en aquaculture sur deux que je rencontre me dit qu’il est nutritioniste aquacole”

→ Parce que l’aliment est encore l’intrant aquacole le plus cher
→ (50-70% en systèmes semi-intensifs et intensifs).

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1. Introduction (suite)

Importance de l'alimentation

- Complément de l'aliment naturel
- Augmentation de la productivité de la ferme
- Predictibilité de la production
- Réduction du cycle de production
- Amélioration de la santé des poissons
- Possibilité de fortification nutritionnelle

Est ce que le coût des aliments est justifié pour l'élevage du tilapia et du poisson chat Africain?

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2. Nutrition aquacole: opportunités et défis

- Changements positifs en nutrition aquacole peuvent avoir un effet sur l'industrie toute entière

  ↘ TCA ⟹ Coûts de Prod.

Rend le poisson plus abordable pour la nutrition humaine

- Nourrir indirectement la population en nourrissant le poisson

Aliment ⟹ Poisson ⟹ Population

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2. Nutrition aquacole: opportunités et défis (suite)

Qualité des données & pertinence de l'information

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2. Nutrition aquacole: opportunités et défis (suite)

Contrôle de qualité des données disponibles???

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2. Nutrition aquacole: opportunités et défis (suite)

Beaucoup de données

Assurance qualité sur les données ?

Ingrédients
- Conventionnels (mais soja, farine de poisson, etc.)
- Non-conventional (concentrés de protéines, etc.)
- Novel / ”sexy” (farine dinsecte, farine d’algues, etc.)

Formulation
- Espèces + Stade de développement
- Digestibilité
- Besoins nutritionnels
- Bases de données + Logiciels

Transformation
- Granuleuse (non-flottant)
- Extrudeuse (floattant)
- Commercial Vs Fait maison

Pas de cadre règlementaire pour certifier les aquaculturistes (nutritionists des poissons *versus* nutritionists humains)

Publications prédatrices (industrie, scientifiques, journaux)

Statistiques discutable

→ Conclusions exagérée

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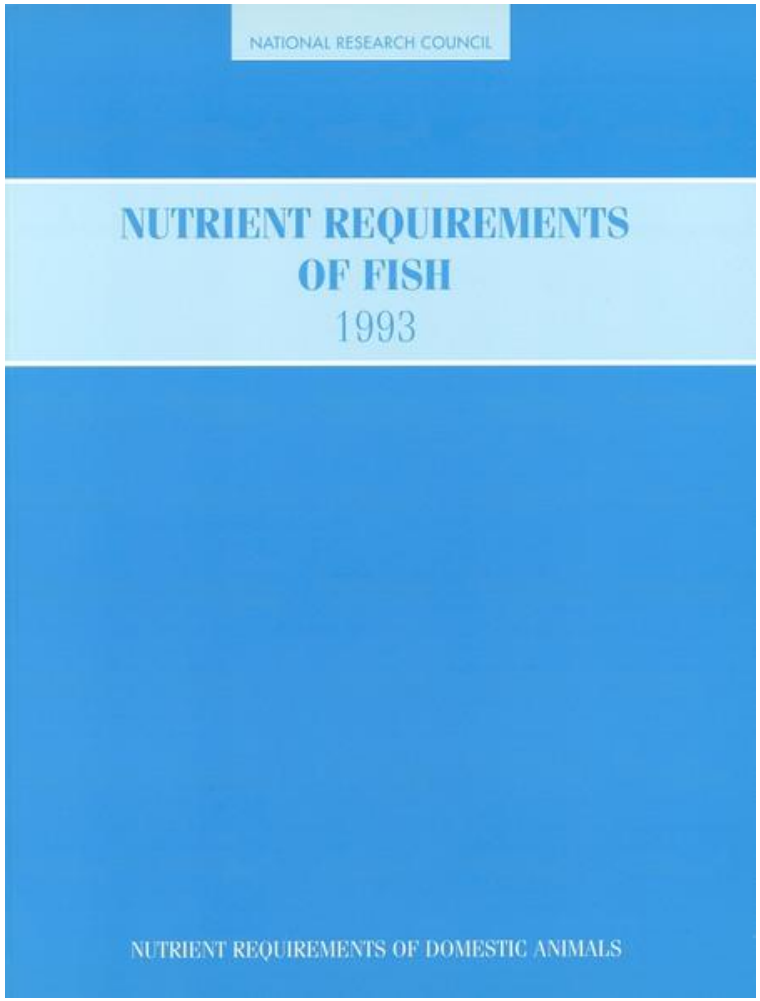
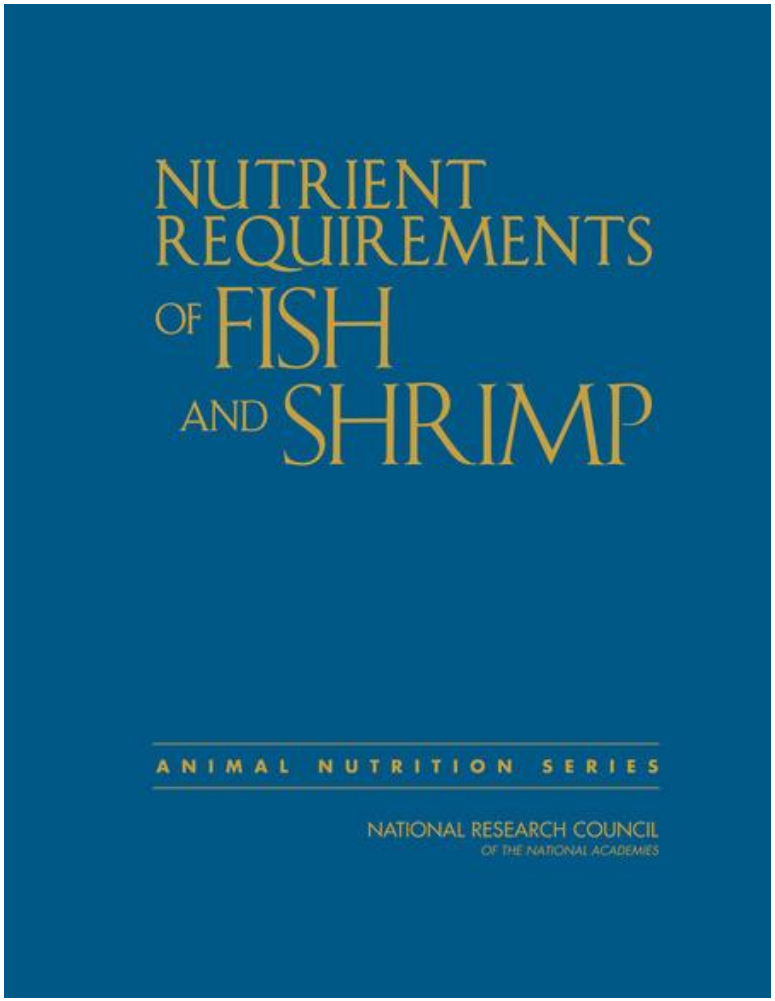
3. Besoins nutritionnels des poissons



18 ans



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3. Besoins nutritionnels des poisons (suite)

Aquaculture 437 (2015) 344–350

Contents lists available at ScienceDirect

Aquaculture

journal homepage: www.elsevier.com/locate/aqua-online

Short communication

Misuse of multiple comparison tests and underuse of contrast procedures in aquaculture publications

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LEs variables expérimentales en nutrition aquacole sont en général quantitatives

Ex: Niveau de protéine (0%, 5%, 10%, 15% et 20%)

→ La bonne statistique doit être la procedure par regression (procedure polynomiale)

3. Besoins nutritionnels des poisons (suite)

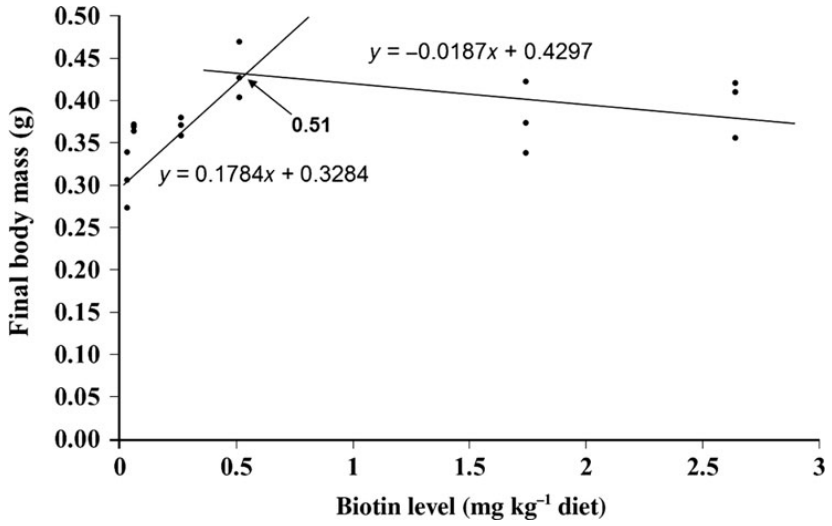
Table 2 Final mass, protein efficiency ratio (PER) and feed conversion ratio (FCR) of zebrafish *Danio rerio* fed diets supplemented with various levels of biotin for 12 weeks*.

Parameters	0.03†					*P-value*	Pooled SEM
Initial mass (g)	0.136				0.136		
Final mass (g)	0.306[c]				0.395[ab]	0.0058	0.017
PER (g g^{-1})†	0.44[b]				[a]	0.0257	3.537
FCR‡						<.0001	0.052

*Means with different … are significantly different (…

†Protein efficiency ratio … wet mass (g) - initial wet mass (g)) / (Quan… ed (g) × protein content of the feed (g g^{-1}))

‡Feed conversion ratio FC… (g g^{-1}) = (Ingested feed (g) × Dry matter content of feed) / (final wet mass (g) - initial wet mass (g))



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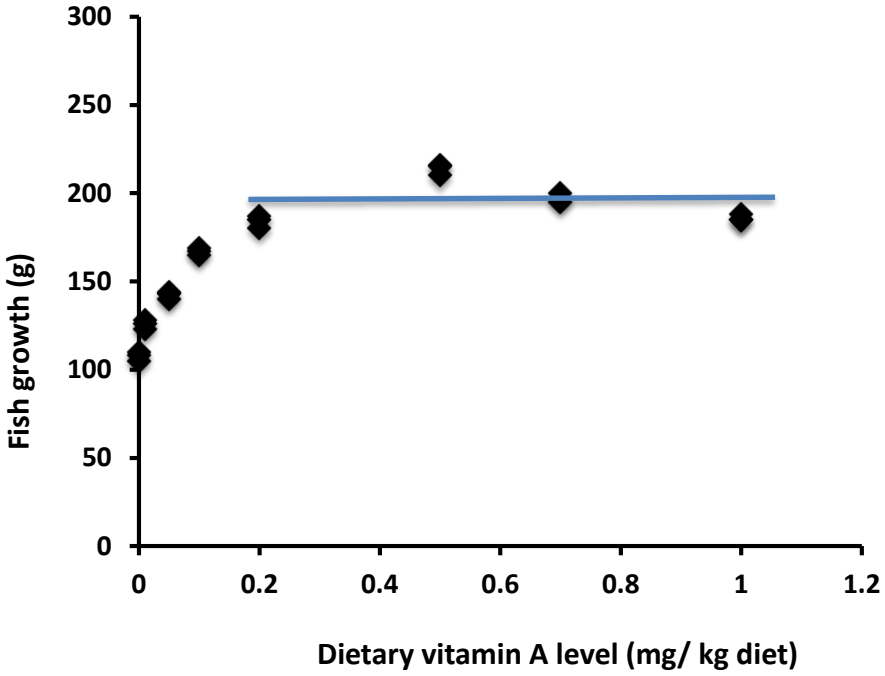
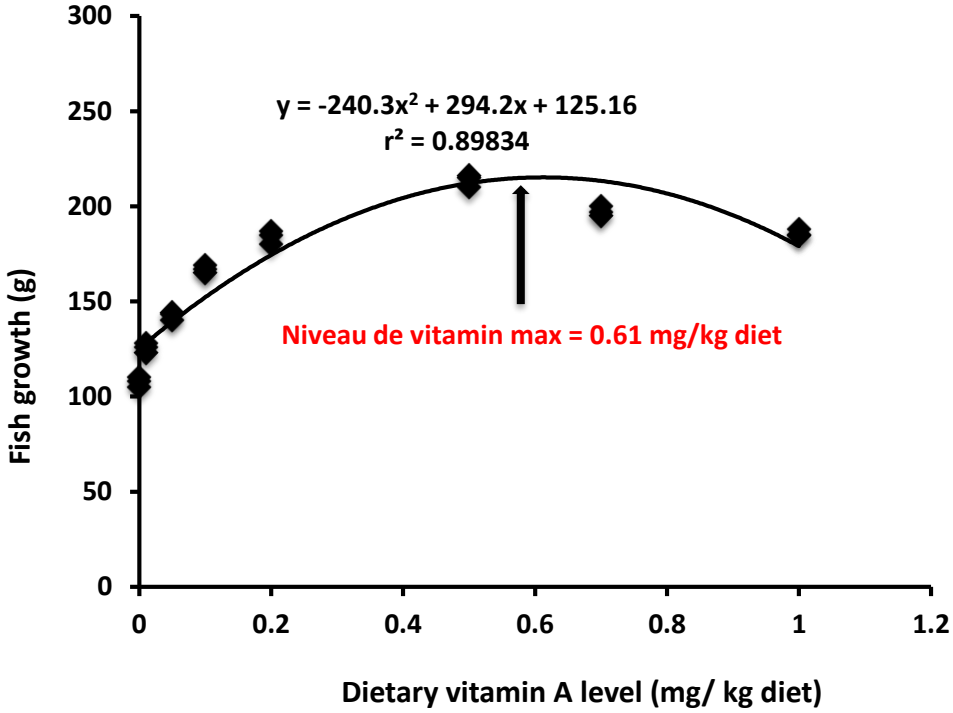
3. Besoins nutritionnels des poisons (suite)



Test de comparaison multiple



Analyse par regression

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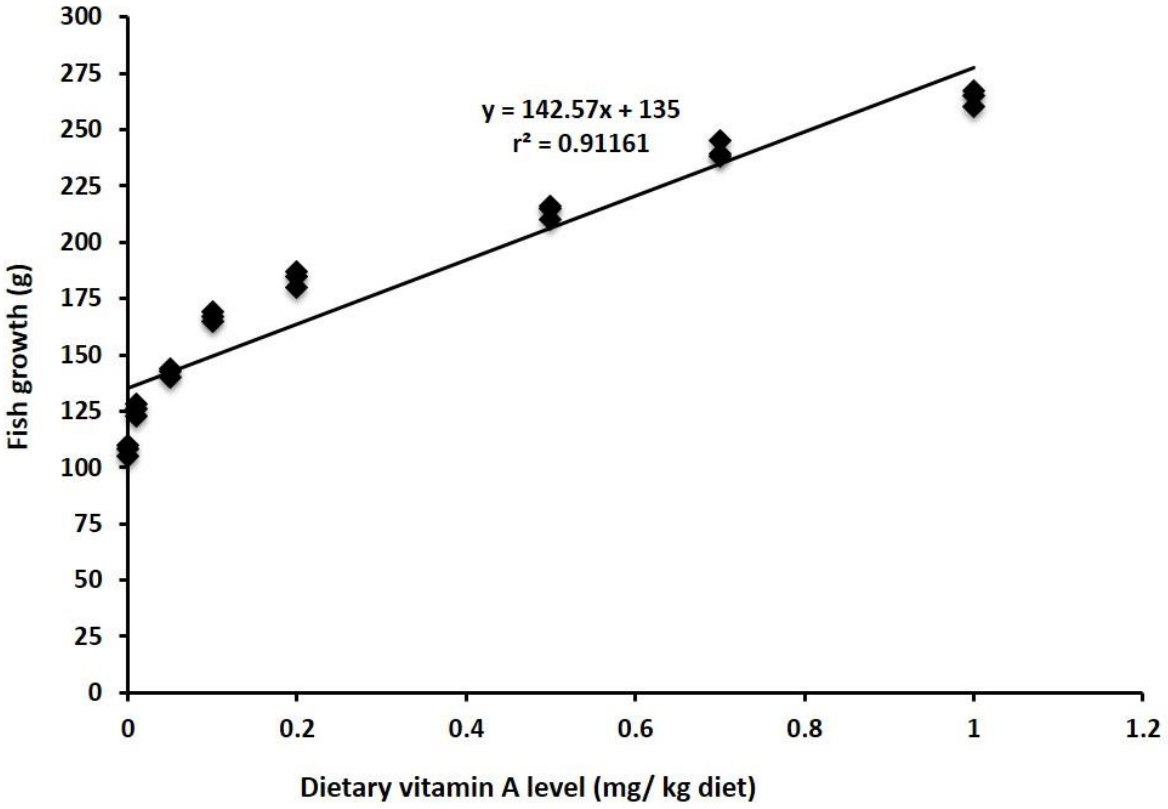
3. Nutrient requirements of fish (cond't)



Analyse par regression

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3. Besoins nutritionnels des poisons (suite)

Beaucoup de données = Très bien!

Mais besoin de savoir faire le tri !

Considérer “données de qualité et information pertinente”!

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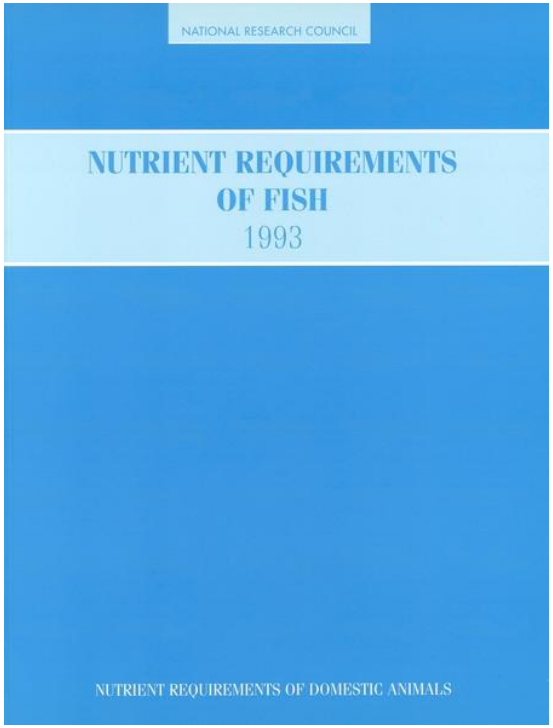
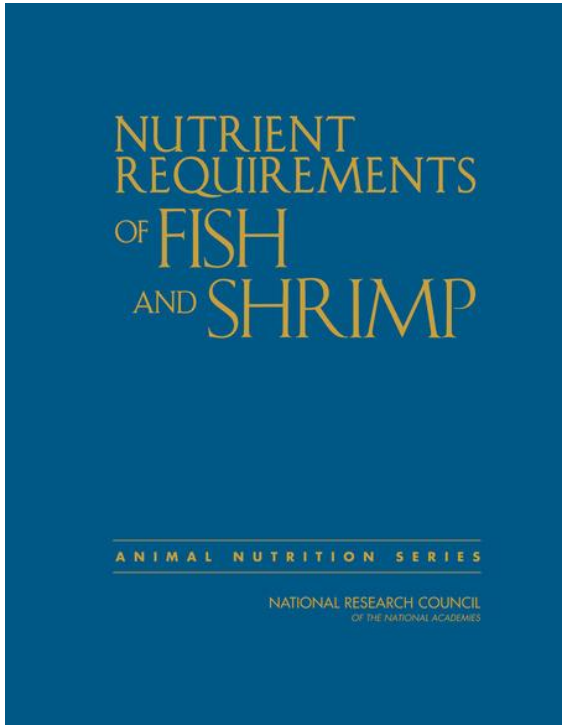
3. Besoins nutritionnels des poisons (suite)

Consolidation des données et informations sur les besoins nutritionnels, ingredients, recettes et aliments





Annuel (et non toutes les décennies)

National ou régional (pas juste Américain)

ISFNF devrait avoir une session sur les metadonnées

Plus de modélisation nutritionnelle

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3. Besoins nutritionnels des poisons (suite)

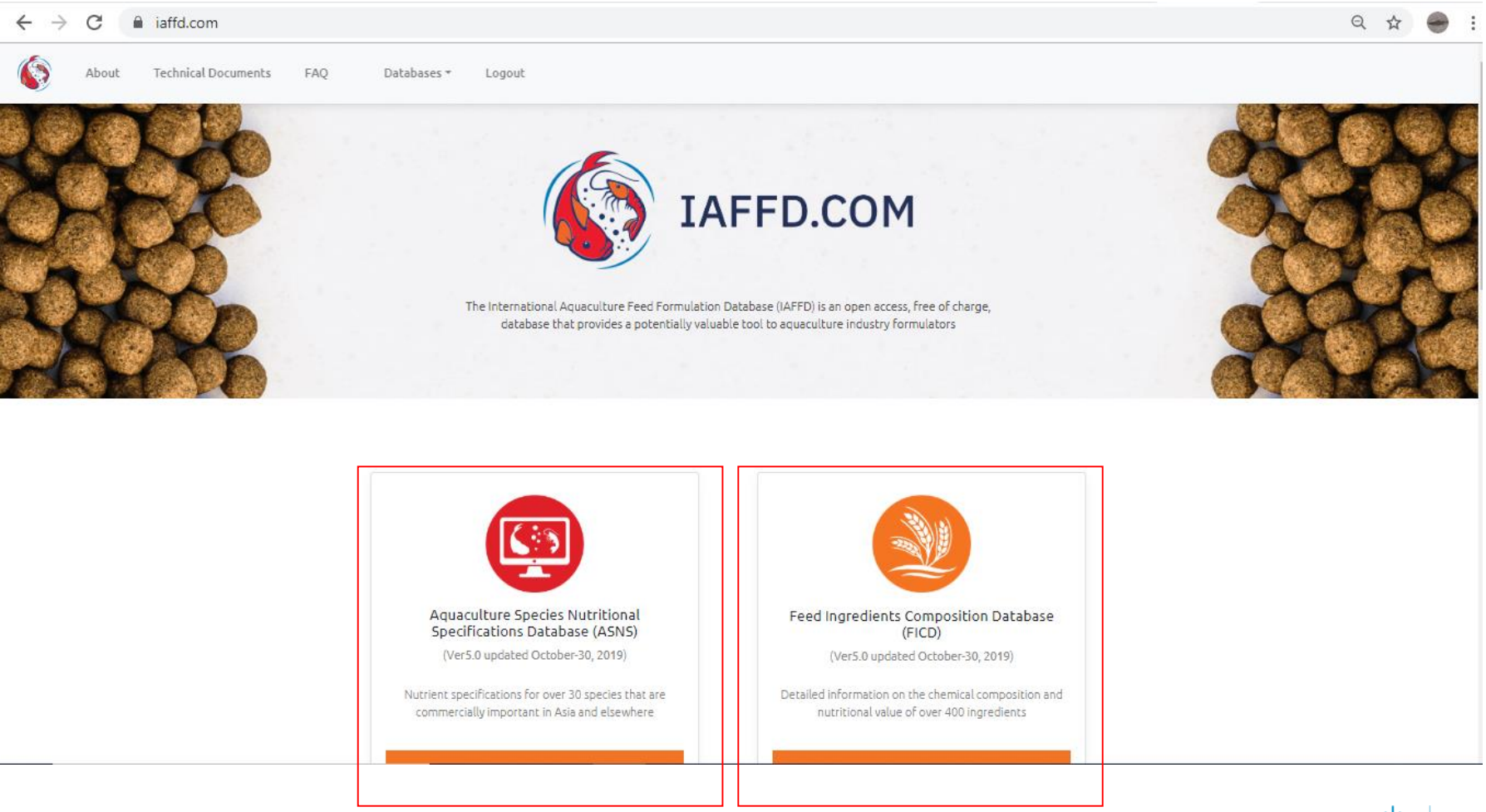
Travail de groupe 1 (3 min)

Par groupe:

D’où provient l’information que vous utilisez pour formuler les aliments?

4. Bases de données

Besoins nutritionnels du poisson



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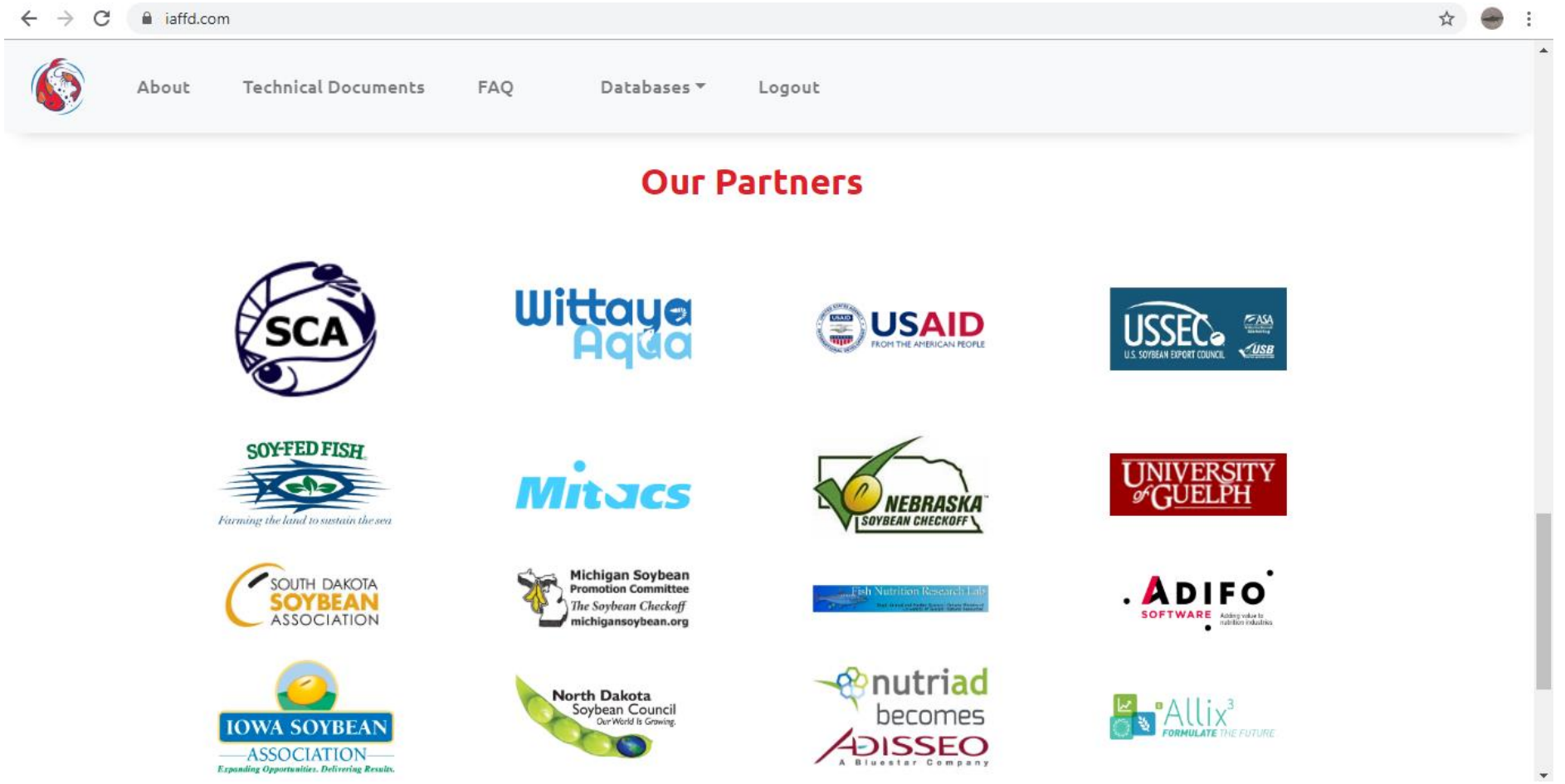
4. Bases de données (suite)

Besoins nutritionnels du poisson



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4. Bases de données (suite)

Besoins nutritionnels du poisson

ure Feed Formulation Database | Nutritional Specification Database | Feed Ingredient Database

Nutrient Specification Database

Fish Species: Abalone (Abalone)

Target Moisture Level of Feed (%): 0

Stage/Live Weight Range (g): < 5 g

Export Report to .CSV

Include all species & stages

Specification Report

Code	Specification	Short Name	Unit	Restriction Type	Value
PA02	Moisture	H2O	%	Minimum	0
PA03	Crude Protein	CP	%	Minimum	31.58
PA04	Crude Lipids	LIPID	%	Minimum	5.26
PA05	Crude Fibre	CF	%	Maximum	0.00
PA06	Ash	ASH	%	Maximum	0.00
PA07	NFE	NFE	%	Maximum	0.00
PA08	NDF	NDF	%	Maximum	0.00
PA09	ADF	ADF	%	Maximum	0.00
PA11	Starch	STARC	%	Minimum	21.05
ADRXF02	Dig CP fish	DP	%	Minimum	28.42

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4. Bases de données (suite)

Besoins nutritionnels du poisson

ure Feed Formulation Database | Nutritional Specification Database | Feed Ingredient Database

Nutrient Specification Database

Fish Species: N-Tilapia-Regular (N-Tilapia-Reg

Target Moisture Level of Feed (%): 10

Stage/Live Weight Range (g): 50-200 g (Pre-grower)

Export Report to .CSV

Include all species & stag

Specification Report

Code	Specification	Short Name	Unit	Restriction Type	Value
PA02	Moisture	H2O	%	Minimum	10
PA03	Crude Protein	CP	%	Minimum	35.05
PA04	Crude Lipids	LIPID	%	Minimum	5.68
PA05	Crude Fibre	CF	%	Maximum	0.00
PA06	Ash	ASH	%	Maximum	0.00
PA07	NFE	NFE	%	Maximum	0.00
PA08	NDF	NDF	%	Maximum	0.00
PA09	ADF	ADF	%	Maximum	0.00
PA11	Starch	STARC	%	Minimum	15.16

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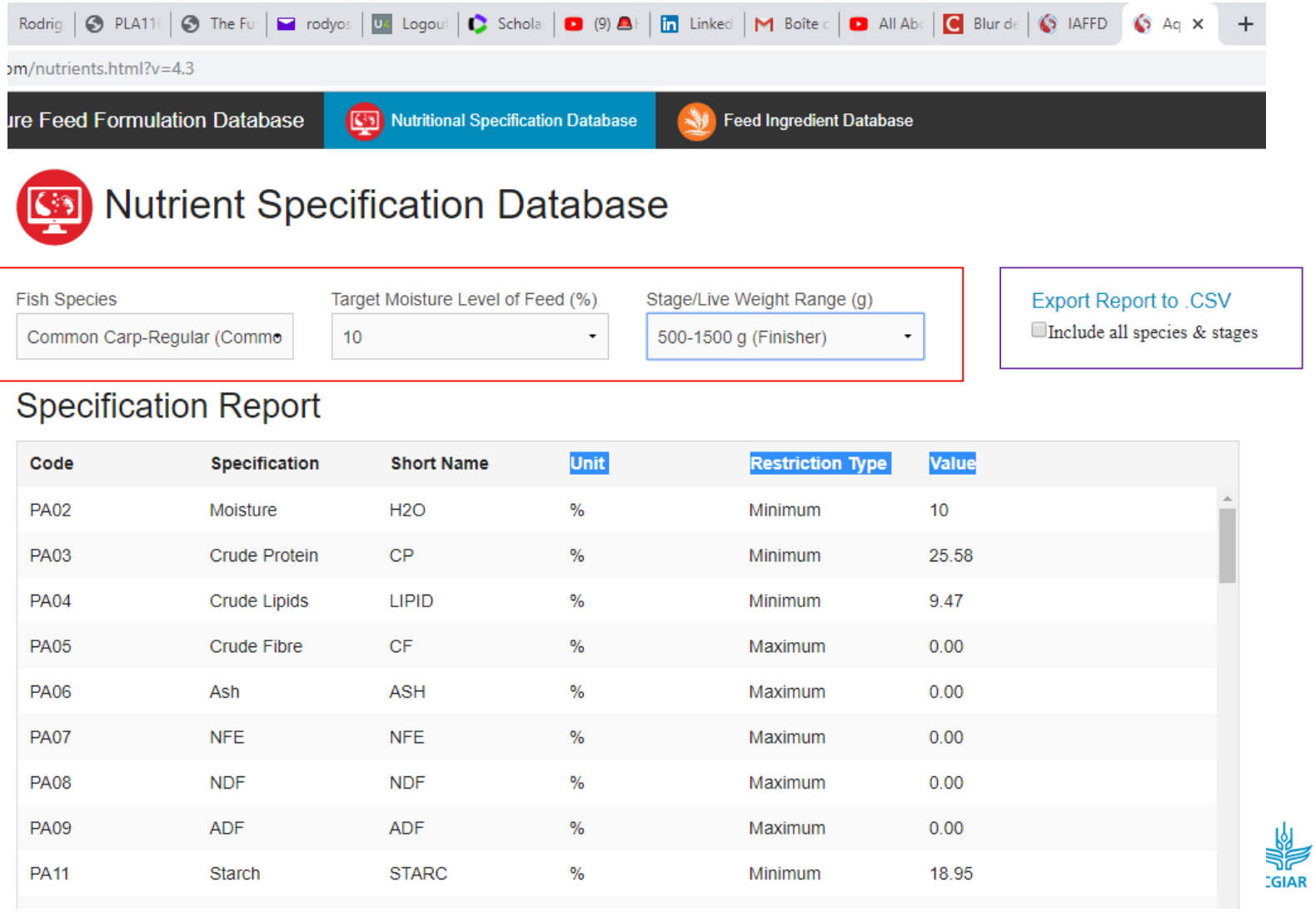
4. Bases de données (suite)

Besoins nutritionnels du poisson



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om/nutrients.html?v=4.3

ure Feed Formulation Database | Nutritional Specification Database | Feed Ingredient Database

Nutrient Specification Database

Fish Species: Common Carp-Regular (Commo

Target Moisture Level of Feed (%): 10

Stage/Live Weight Range (g): 500-1500 g (Finisher)

Export Report to .CSV

Include all species & stages

Specification Report

Code	Specification	Short Name	Unit	Restriction Type	Value
PA02	Moisture	H2O	%	Minimum	10
PA03	Crude Protein	CP	%	Minimum	25.58
PA04	Crude Lipids	LIPID	%	Minimum	9.47
PA05	Crude Fibre	CF	%	Maximum	0.00
PA06	Ash	ASH	%	Maximum	0.00
PA07	NFE	NFE	%	Maximum	0.00
PA08	NDF	NDF	%	Maximum	0.00
PA09	ADF	ADF	%	Maximum	0.00
PA11	Starch	STARC	%	Minimum	18.95

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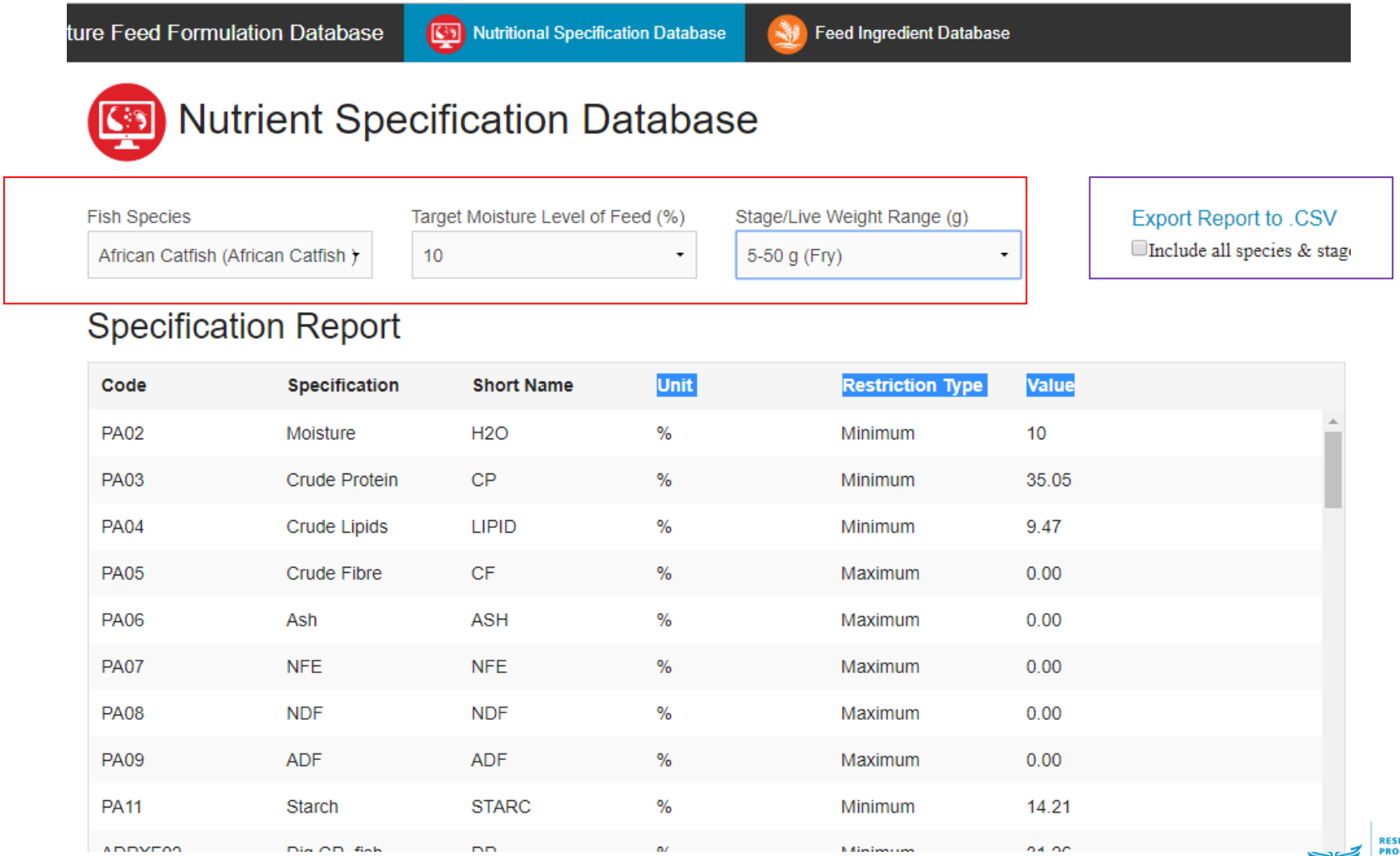
4. Bases de données (suite)

Besoins nutritionnels du poisson



Code	Specification	Short Name	Unit	Restriction Type	Value
PA02	Moisture	H2O	%	Minimum	10
PA03	Crude Protein	CP	%	Minimum	35.05
PA04	Crude Lipids	LIPID	%	Minimum	9.47
PA05	Crude Fibre	CF	%	Maximum	0.00
PA06	Ash	ASH	%	Maximum	0.00
PA07	NFE	NFE	%	Maximum	0.00
PA08	NDF	NDF	%	Maximum	0.00
PA09	ADF	ADF	%	Maximum	0.00
PA11	Starch	STARC	%	Minimum	14.21
ADRXF03	Dig CP fish	DP	%	Minimum	31.26

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4. Bases de données (suite)

Besoins nutritionnels du poisson

Travail de groupe 2 (15 min)

Quels sont les besoins nutritionnels du tilapia à différents stades de vie?

I. Démarrage/Starter (groupe 1)

II. Alevins/Fry (groupe 2)

III. Pré-grossissement/Pre-grower (groupe 3)

IV. Grossissement/Grower (groupe 4)

V. Finition/Finisher (groupe 5)

VI. Géniteurs/Broodstock (groupe 6)

Résultats attendus

1. Protein brutes
2. Protéine digestible (DP)
3. Lipide
4. Lipide digestible
5. Énergie brute
6. Énergie digestible (DE)
7. Rapport DP/DE
8. Lysine
9. Méthionine

4. Bases de données (suite)

Composition des ingrédients

International Aquaculture Feed Formulation Database | Nutritional Specification Database | Feed Ingredient Database | Help/FAQ

Feed Ingredient Composition Database

Export Report to .CSV

Show 25 entries

Search:

Ing_Code	Ing_Descr_E	Dry Matter(%)	Moisture(%)	Crude Protein(%)	Crude Lipids(%)	Crude Fibre(%)	Ash(%)
10000	Fish meal, India, 74% CP	90.80	9.20	74.16	4.97	0.50	10.00
10001	Fish meal, Chile, 64% CP	92.00	8.00	63.60	8.40	0.50	15.60
10002	Fish meal, Peru, 67% CP	93.90	6.10	66.95	11.50	0.00	15.40
10003	Fish meal, Danish, 70% CP	92.50	7.50	70.69	9.74	0.30	11.70
10004	Fish meal, Thailand, 55% CP	91.80	8.20	55.00	6.00	0.50	30.00
10005	Fish meal, 55% CP	90.00	10.00	54.04	8.73	0.65	23.77
10006	Fish meal, 65% CP	90.90	9.10	63.85	8.14	0.20	18.68
10007	Fish meal, 70% CP, low temperature	92.00	8.00	70.00	10.00	0.00	12.00
10008	Fish meal, Alaskan pollock, processing waste	94.40	5.60	69.00	7.60	0.50	17.30
10009	Fish meal, anchovy	91.90	8.10	66.95	8.83	0.70	15.40
10010	Fish meal, cod, processing waste	92.00	8.00	70.20	5.60	0.00	16.20

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4. Bases de données (suite)

Composition des ingrédients

Travail de groupe 3 (10 min)

Chaque groupe:

Choisissez un ingrédient qui est abondant dans votre pays et donnez sa composition nutritionnelle

Résultats attendus

1. Protein brutes
2. Protéine digestible (DP)
3. Lipide
4. Lipide digestible
5. Énergie brute
6. Énergie digestible (DE)
7. Rapport DP/DE
8. Lysine
9. Méthionine

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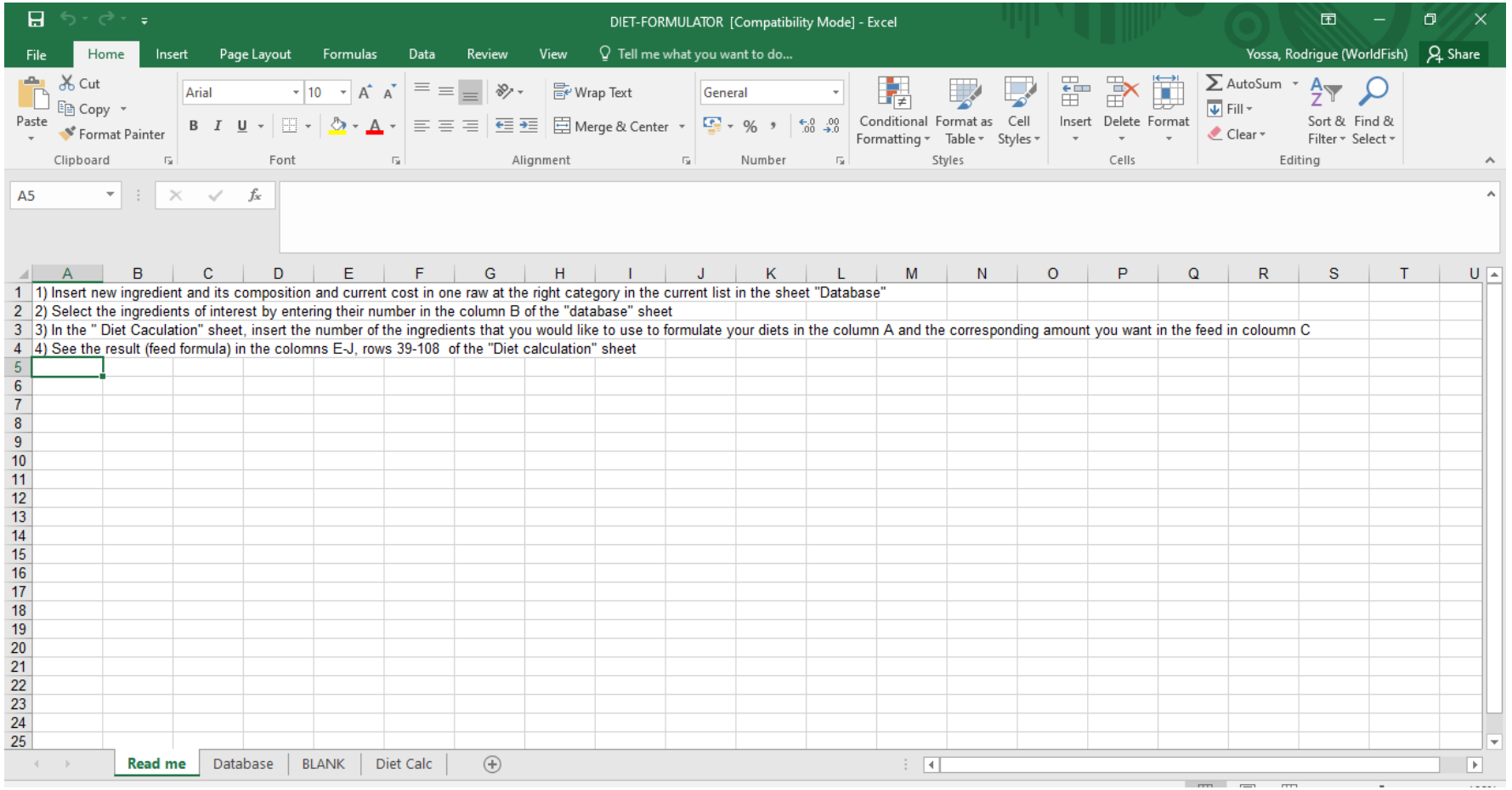
5. Formulation des aliments pour poissons



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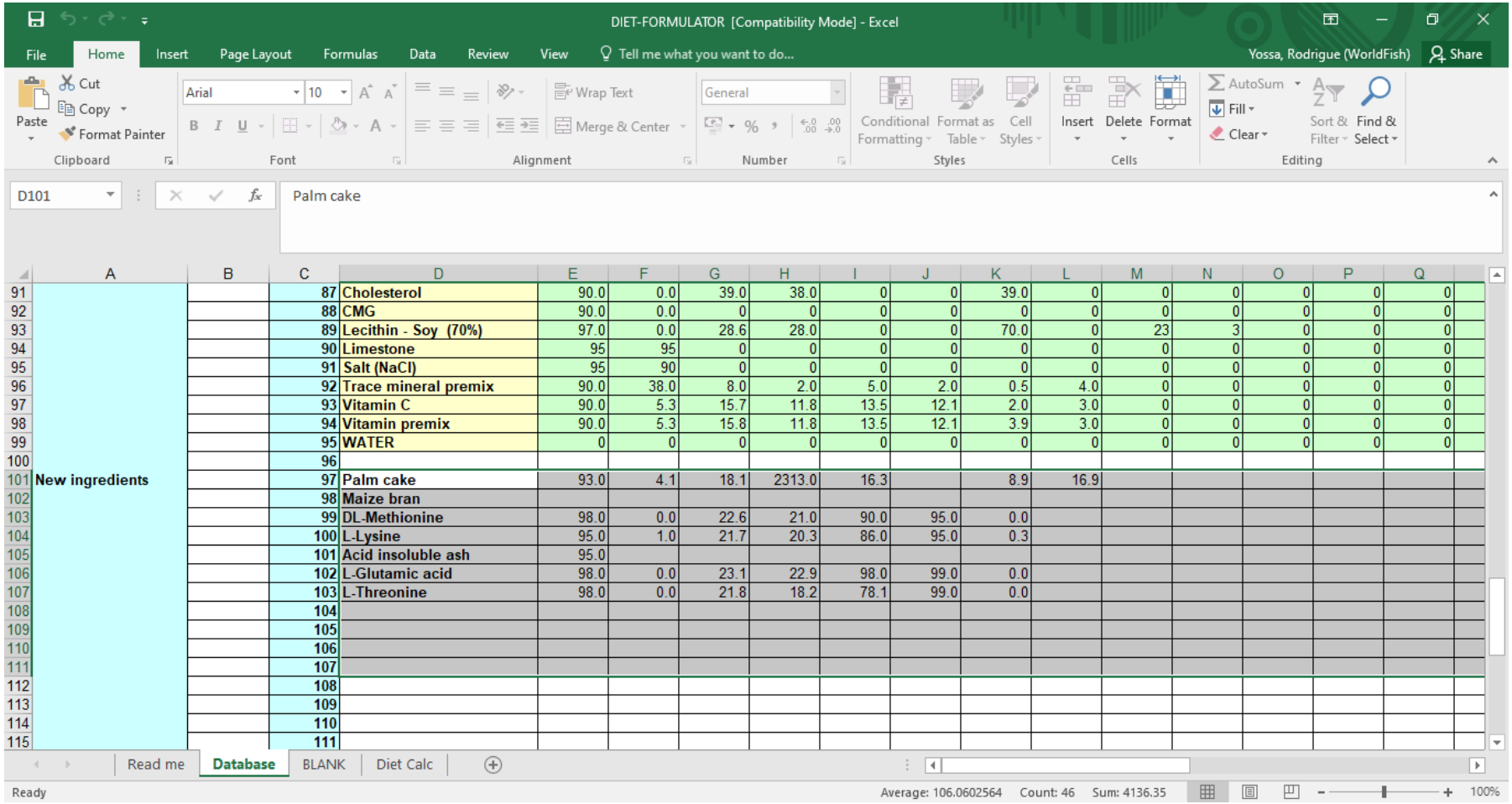
5. Formulation des aliments pour poisons (suite)



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
91			87	Cholesterol	90.0	0.0	39.0	38.0	0	0	39.0	0	0	0	0	0	0
92			88	CMG	90.0	0.0	0	0	0	0	0	0	0	0	0	0	0
93			89	Lecithin - Soy (70%)	97.0	0.0	28.6	28.0	0	0	70.0	0	23	3	0	0	0
94			90	Limestone	95	95	0	0	0	0	0	0	0	0	0	0	0
95			91	Salt (NaCl)	95	90	0	0	0	0	0	0	0	0	0	0	0
96			92	Trace mineral premix	90.0	38.0	8.0	2.0	5.0	2.0	0.5	4.0	0	0	0	0	0
97			93	Vitamin C	90.0	5.3	15.7	11.8	13.5	12.1	2.0	3.0	0	0	0	0	0
98			94	Vitamin premix	90.0	5.3	15.8	11.8	13.5	12.1	3.9	3.0	0	0	0	0	0
99			95	WATER	0	0	0	0	0	0	0	0	0	0	0	0	0
100			96														
101	New ingredients		97	Palm cake	93.0	4.1	18.1	2313.0	16.3		8.9	16.9					
102			98	Maize bran													
103			99	DL-Methionine	98.0	0.0	22.6	21.0	90.0	95.0	0.0						
104			100	L-Lysine	95.0	1.0	21.7	20.3	86.0	95.0	0.3						
105			101	Acid insoluble ash	95.0												
106			102	L-Glutamic acid	98.0	0.0	23.1	22.9	98.0	99.0	0.0						
107			103	L-Threonine	98.0	0.0	21.8	18.2	78.1	99.0	0.0						
108			104														
109			105														
110			106														
111			107														
112			108														
113			109														
114			110														
115			111														

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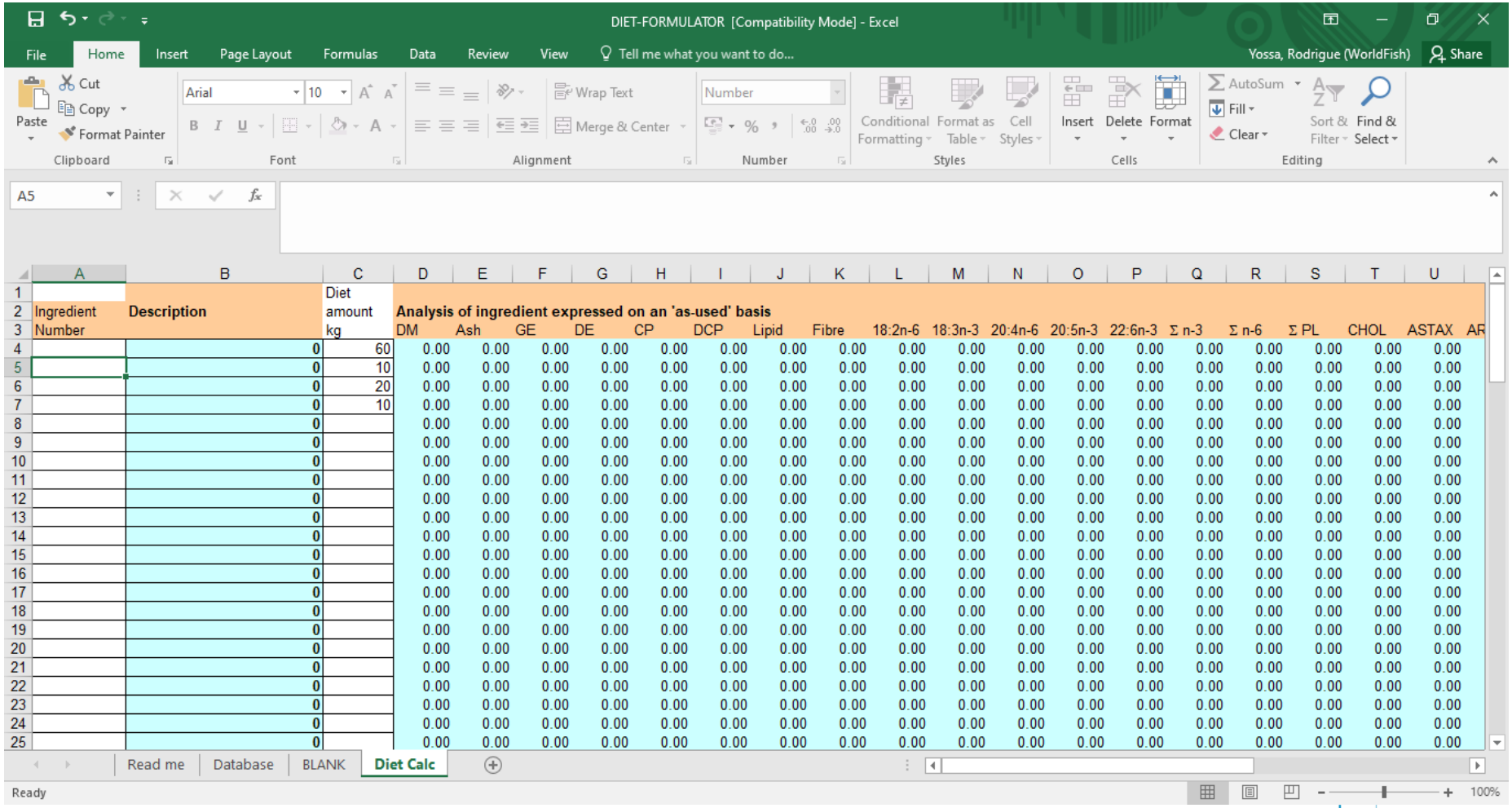
5. Formulation des aliments pour poisons (suite)



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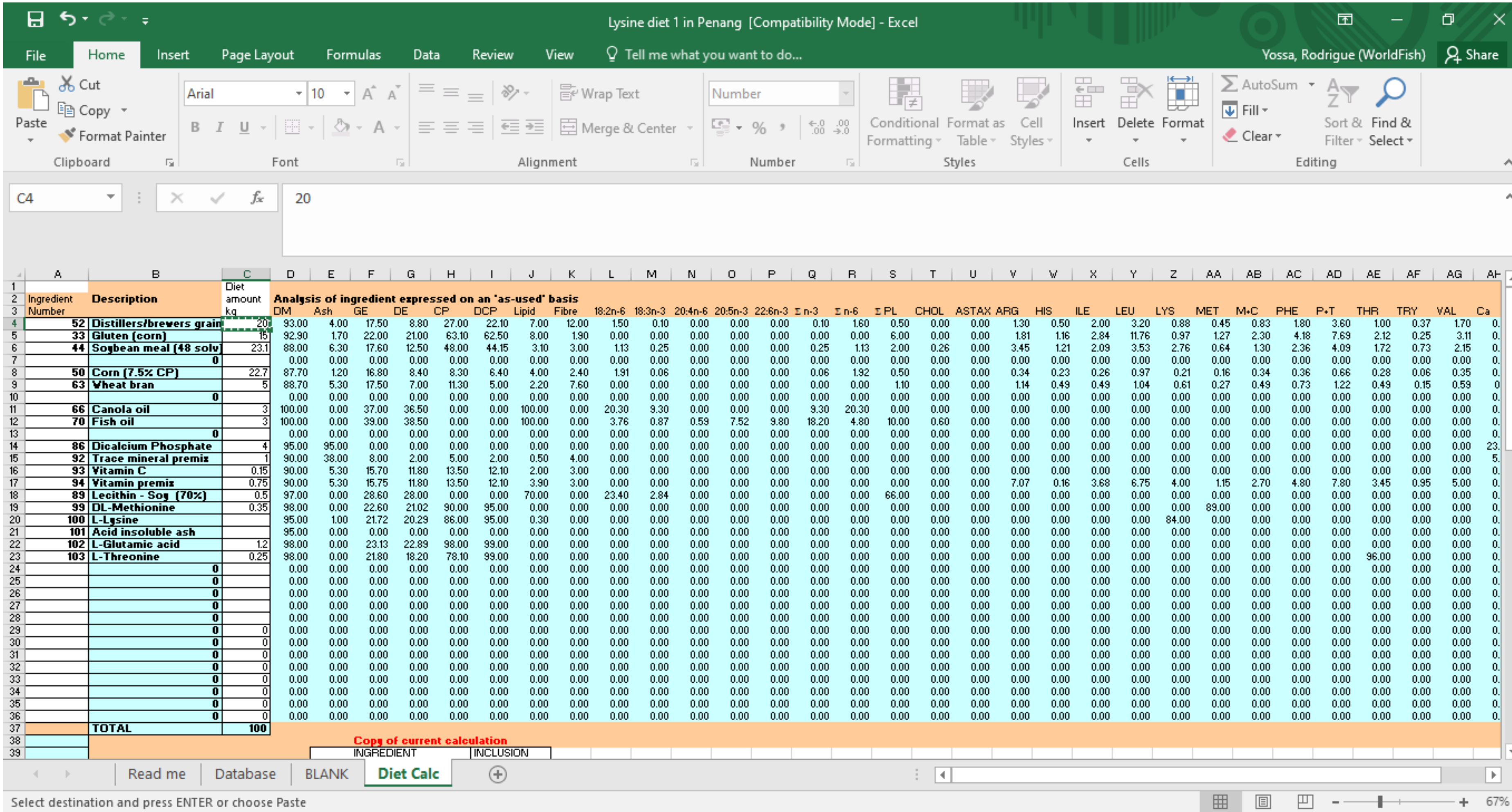
5. Formulation des aliments pour poisons (suite)



Row	A: Ingredient Number	B: Description	C: Diet amount kg	D: DM	E: Ash	F: GE	G: DE	H: CP	I: DCP	J: Lipid	K: Fibre	L: 18:2n-6	M: 18:3n-3	N: 20:4n-6	O: 20:5n-3	P: 22:6n-3	Q: Σ n-3	R: Σ n-6
2				Analysis of ingredient expressed on an 'as-used' basis														
4	52	Distillers/brewers grain	20	93.00	4.00	17.50	8.80	27.00	22.10	7.00	12.00	1.50	0.10	0.00	0.00	0.00	0.10	1.60
5	33	Gluten (corn)	15	92.90	1.70	22.00	21.00	63.10	62.50	8.00	1.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	44	Soybean meal (48 solv)	23.1	88.00	6.30	17.60	12.50	48.00	44.15	3.10	3.00	1.13	0.25	0.00	0.00	0.00	0.25	1.13
7		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	50	Corn (7.5% CP)	22.7	87.70	1.20	16.80	8.40	8.30	6.40	4.00	2.40	1.91	0.06	0.00	0.00	0.00	0.06	1.92
9	63	Wheat bran	5	88.70	5.30	17.50	7.00	11.30	5.00	2.20	7.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	66	Canola oil	3	100.00	0.00	37.00	36.50	0.00	0.00	100.00	0.00	20.30	9.30	0.00	0.00	0.00	9.30	20.30
12	70	Fish oil	3	100.00	0.00	39.00	38.50	0.00	0.00	100.00	0.00	3.76	0.87	0.59	7.52	9.80	18.20	4.80
13		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	86	Dicalcium Phosphate	4	95.00	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	92	Trace mineral premix	1	90.00	38.00	8.00	2.00	5.00	2.00	0.50	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	93	Vitamin C	0.15	90.00	5.30	15.70	11.80	13.50	12.10	2.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	94	Vitamin premix	0.75	90.00	5.30	15.75	11.80	13.50	12.10	3.90	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	89	Lecithin - Soy (70%)	0.5	97.00	0.00	28.60	28.00	0.00	0.00	70.00	0.00	23.40	2.84	0.00	0.00	0.00	0.00	0.00
19	99	DL-Methionine	0.35	98.00	0.00	22.60	21.02	90.00	95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	100	L-Lysine		95.00	1.00	21.72	20.29	86.00	95.00	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	101	Acid insoluble ash		95.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	102	L-Glutamic acid	1.2	98.00	0.00	23.13	22.89	98.00	99.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	103	L-Threonine	0.25	98.00	0.00	21.80	18.20	78.10	99.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28		0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
30		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
31		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
32		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
33		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
34		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
35		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
36		0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
37		TOTAL	100															
38						Copy of current calculation												
39						INGREDIENT			INCLUSION									

Row	S: Σ PL	T: CHOL	U: ASTAX	V: ARG	W: HIS	X: ILE	Y: LEU	Z: LYS	AA: MET	AB: M+C	AC: PHE	AD: P+T	AE: THR	AF: TRY	AG: VAL	AH: Ca
4	0.50	0.00	0.00	1.30	0.50	2.00	3.20	0.88	0.45	0.83	1.80	3.60	1.00	0.37	1.70	0.
5	6.00	0.00	0.00	1.81	1.16	2.84	11.76	0.97	1.27	2.30	4.18	7.69	2.12	0.25	3.11	0.
6	2.00	0.26	0.00	3.45	1.21	2.09	3.53	2.76	0.64	1.30	2.36	4.09	1.72	0.73	2.15	0.
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
8	0.50	0.00	0.00	0.34	0.23	0.26	0.97	0.21	0.16	0.34	0.36	0.66	0.28	0.06	0.35	0.
9	1.10	0.00	0.00	1.14	0.49	0.49	1.04	0.61	0.27	0.49	0.73	1.22	0.49	0.15	0.59	0
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
12	10.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
17	0.00	0.00	0.00	7.07	0.16	3.68	6.75	4.00	1.15	2.70	4.80	7.80	3.45	0.95	5.00	0.
18	66.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	84.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	96.00	0.00	0.00	0.
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.

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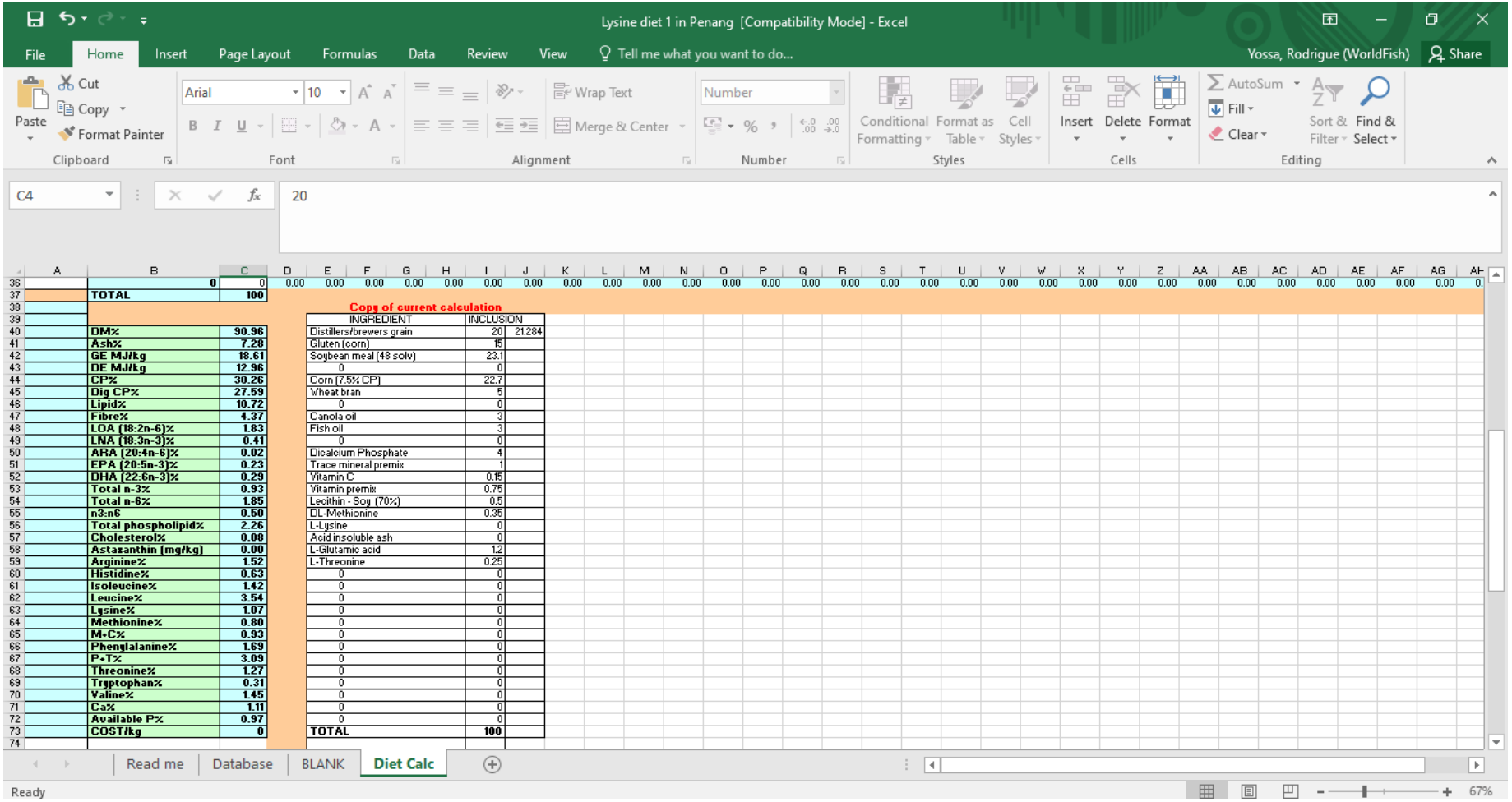
5. Formulation des aliments pour poisons (suite)



Lysine diet 1 in Penang [Compatibility Mode] - Excel

	TOTAL	100
	DM%	90.96
	Ash%	7.28
	GE MJ/kg	18.61
	DE MJ/kg	12.96
	CP%	30.26
	Dig CP%	27.59
	Lipid%	10.72
	Fibre%	4.37
	LOA (18:2n-6)%	1.83
	LNA (18:3n-3)%	0.41
	ARA (20:4n-6)%	0.02
	EPA (20:5n-3)%	0.23
	DHA (22:6n-3)%	0.29
	Total n-3%	0.93
	Total n-6%	1.85
	n3:n6	0.50
	Total phospholipid%	2.26
	Cholesterol%	0.08
	Astaxanthin (mg/kg)	0.00
	Arginine%	1.52
	Histidine%	0.63
	Isoleucine%	1.42
	Leucine%	3.54
	Lysine%	1.07
	Methionine%	0.80
	M+C%	0.93
	Phenylalanine%	1.69
	P+T%	3.09
	Threonine%	1.27
	Tryptophan%	0.31
	Valine%	1.45
	Ca%	1.11
	Available P%	0.97
	COST/kg	0

Copy of current calculation

INGREDIENT	INCLUSION	
Distillers/brewers grain	20	21.284
Gluten (corn)	15	
Soybean meal (48 solv)	23.1	
0	0	
Corn (7.5% CP)	22.7	
Wheat bran	5	
0	0	
Canola oil	3	
Fish oil	3	
0	0	
Dicalcium Phosphate	4	
Trace mineral premix	1	
Vitamin C	0.15	
Vitamin premix	0.75	
Lecithin - Soy (70%)	0.5	
DL-Methionine	0.35	
L-Lysine	0	
Acid insoluble ash	0	
L-Glutamic acid	1.2	
L-Threonine	0.25	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
0	0	
TOTAL	100	

Read me | Database | BLANK | Diet Calc

Ready

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5. Formulation des aliments pour poisons (suite)

Comment formuler l'aliment pour le tilapia

INGREDIENTS	INCLUSION
Fish meal (70% - Danish)	15
Gluten (corn)	8
Soybean meal (48 solv)	20.9
Corn (7.5% CP)	29.8
Wheat bran	16
Tapioca/sago flour	0
Palm oil	1
Fish oil	1.5
Dicalcium Phosphate	2
Trace mineral premix	2
Vitamin C	0.15
Vitamin premix	0.75
Lecithin - Soy (70%)	0.5
DL-Methionine	0.25
L-Lysine	0.15
TOTAL	100

DM%	89.37
Ash%	7.38
GE MJ/kg	18.12
DE MJ/kg	11.62
CP%	31.50
Dig CP%	27.60
Lipid%	7.88
Fibre%	3.21
LOA (18:2n-6)%	1.04
LNA (18:3n-3)%	0.11
ARA (20:4n-6)%	0.04
EPA (20:5n-3)%	0.21
DHA (22:6n-3)%	0.47
Total n-3%	0.78
Total n-6%	1.08
n3:n6	0.73
Total phospholipid%	2.58
Cholesterol%	0.08
Astaxanthin (mg/kg)	0.00
Arginine%	2.13
Histidine%	0.79
Isoleucine%	1.38
Leucine%	3.09
Lysine%	1.94
Methionine%	0.90
M+C%	1.12
Phenylalanine%	1.57
P+T%	2.77
Threonine%	1.29
Tryptophan%	0.35
Valine%	1.53
Ca%	1.33
Available P%	1.10
COST/kg	0

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5. Formulation des aliments pour poisons (suite)

Travail de groupe 4 (15 min)

Chaque groupe: Formuler une recette alimentaire pour chaque stade de vie du tilapia

I. Démarrage/Starter (groupe 1)
II. Alevins/Fry (groupe 2)
III. Pré-grossissement/Pre-grower (groupe 3)
IV. Grossissement/Grower (groupe 4)
V. Finition/Finisher (groupe 5)
VI. Géniteurs/Broodstock (groupe 6)

6. Préparation des aliments

6. Préparation des aliments (suite)

6. Préparation des aliments (suite)

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6. Préparation des aliments (suite)

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6. Préparation des aliments (suite)

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7. Alimentation des poissons

7. Alimentation des poisons (suite)

Table alimentaire

Table 1. Suggested feed size and feeding rate of tank-cultured tilapia			
Length (inches)	Estimated weight (grams)	Recommended Feed Size	Range of feeding rate (% biomass/day)
< 1	< 0.5	#00, #0, #1 Crumble	20- 15
1 - 2.5	0.5 - 5	Stage 1	15 - 10
2.5 - 4	5 - 22	Stage 2	10 - 5
4 - 6	22 - 75	Stage 3	5 - 3
6 - 8	75 - 150	Stage 4	3 - 1.5
8 -13	150 - market	Stage 4	3 - 1.5
13+	> market size	Stage 4	1
*Adapted from SRAC Publication 282 (DeLong et al., 2009)			

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Discussion (Questions, commentaires)

Enquête

Thank You

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JAMES COOK UNIVERSITY AUSTRALIA

UNIVERSITY of GREENWICH

WAGENINGEN UNIVERSITY & RESEARCH