

Expeller-pressed vs. solvent- extracted *B. napus* vs. *B. juncea* meal for laying hens

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Acknowledgments



Background

- Canola meal science cluster
 - Objective: to increase AME in meal by 10% (i.e., 2.2 Mcal from 2.0 Mcal)
- *B. juncea* has thinner seed coat than *B. napus*
 - Lower fibre meal (higher AME?)
 - But contains higher total glucosinolate



Background

- Expeller-pressed meals contain higher fat content and therefore higher anticipated AME
 - 2.7 - 2.8 Mcal/kg (estimated from broiler work)
 - Questions around feedstock quality differences



Background

- Current recommendation is 10% maximum in layer rations
 - Based on ‘potential effects on mortality’
 - Can we push the limit???



Objectives

- To compare performance and egg quality among layers fed diets containing 20% of one of:
 - *B. napus* solvent-extracted meal
 - *B. napus* extruded-expelled meal
 - *B. juncea* solvent-extracted meal
 - *B. juncea* extruded-expelled meal



Objectives (cont'd)

- Main questions we want to answer:
 - Can layers tolerate 20% inclusion of these meals without adversely affecting performance or egg quality?
 - Can we assume the same digestible nutrient content between *B. juncea* and *B. napus* when formulating layer diets?



METHODS AND MATERIALS



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Methods and Materials

- Formulated iso-caloric/iso-nitrogenous diets containing 20% of 1 of 4 test ingredients
 - Different nutrient matrices assumed for EXP and SE meals (but Napus=Juncea)



Test diet formulations

Ingredient	SE Napus	EXP Napus	SE Juncea	EXP Juncea
Wheat grain	12.71	27.34	12.71	27.34
Barley grain	43.47	28.54	43.47	28.54
Soybean meal	5.10	4.68	5.10	4.68
Wheat DDGS	1.05	4.07	1.05	4.07
Solvent-extracted <i>B. napus</i> meal	20.00			
Expeller-pressed <i>B. napus</i> meal		20.00		
Solvent-extracted <i>B. juncea</i> meal			20.00	
Expeller-pressed <i>B. juncea</i> meal				20.00
Canola oil	6.50	4.20	6.50	4.20
Salt	0.11	0.13	0.11	0.13
Sodium bicarbonate	0.29	0.25	0.29	0.25
Limestone (fine-coarse blend)	9.07	9.15	9.07	9.15
Dicalcium phosphate	0.45	0.40	0.45	0.40
Lysine HCl	0.06	0.07	0.06	0.07
D,L - Methionine	0.13	0.10	0.13	0.10
Threonine	0.01	0.02	0.01	0.02
Vitamin/mineral premix	1.00	1.00	1.00	1.00
Superzyme Plus	0.05	0.05	0.05	0.05



Formula specifications

Ingredient	Target	SE Napus	EXP Napus	SE Juncea	EXP Juncea
Crude fat	<i>minimize</i>	7.81	8.03	7.81	8.03
Crude protein	17.50	17.50	17.50	17.50	17.50
AME, Mcal/kg	2.80	2.80	2.80	2.80	2.80
Linoleic acid	1.90	1.90	1.95	1.90	1.95
Calcium	3.70	3.70	3.70	3.70	3.70
Available P	0.38	0.43	0.43	0.43	0.43
Sodium	0.17	0.17	0.17	0.17	0.17
Chloride	0.17	0.17	0.17	0.17	0.17
AID Arginine	0.67	0.82	0.79	0.82	0.79
AID Isoleucine	0.52	0.55	0.55	0.55	0.55
AID Lysine	0.65	0.68	0.68	0.68	0.68
AID Methionine	0.32	0.35	0.37	0.35	0.37
AID Met + Cys	0.59	0.62	0.62	0.62	0.62
AID Threonine	0.46	0.48	0.48	0.48	0.48
AID Tryptophan	0.14	0.22	0.20	0.22	0.20
AID Valine	0.57	0.68	0.65	0.68	0.65



Methods and Materials (cont'd)

- Test system:
 - Brown Nick hens (n=192; H & N International)
 - Housed in conventional battery (668 cm²/bird)



Methods and Materials (cont'd)

- Experimental design:
 - RCB design with 6 replicate cages (4 hens/cage) per treatment
 - Sampling unit
 - Bird = BW, Post-mortem, serology
 - Egg = egg quality measures, component wts
 - Composite egg/yolk sample = egg fatty acids, yolk TMA
 - Cage = ADFI, Egg:Feed



Methods and Materials (cont'd)

- Study period = 36-wk production cycle
- Measurements/calculations
 - Daily: Egg counts
 - Weekly: Egg wt, egg mass production
 - 4-wk intervals: ADFI, egg:feed, BW
 - Non-repeated: Fatty acids, egg components, egg quality



Methods and Materials (cont'd)

- Statistical analysis (PROC MIXED)
 - Fixed effects: **species** (*B. napus*, *B. juncea*), **meal type** (EXP, SE), **2-way interaction**
 - Random effects: block
 - Repeated term: week/period (repeated measures only)



RESULTS AND DISCUSSION

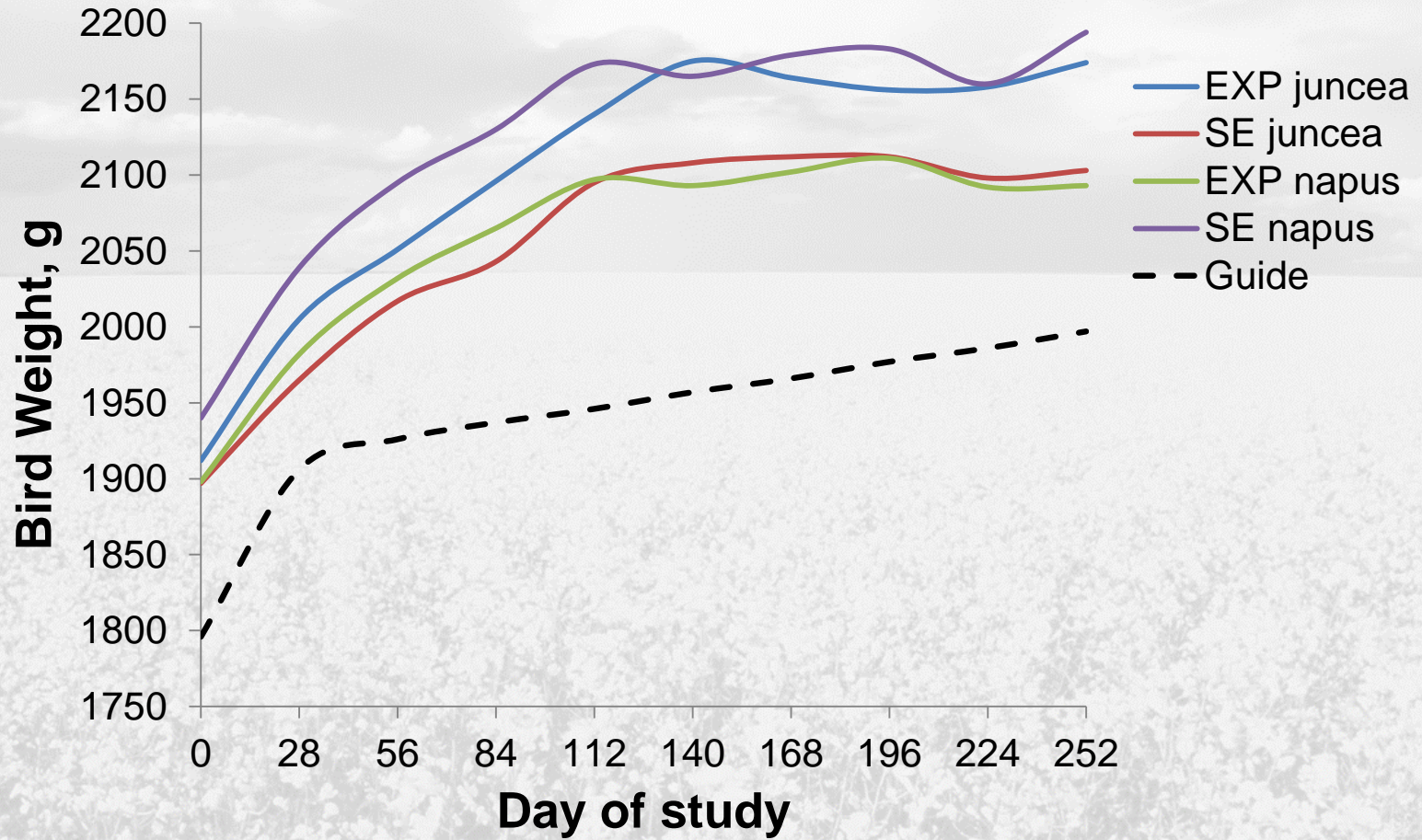


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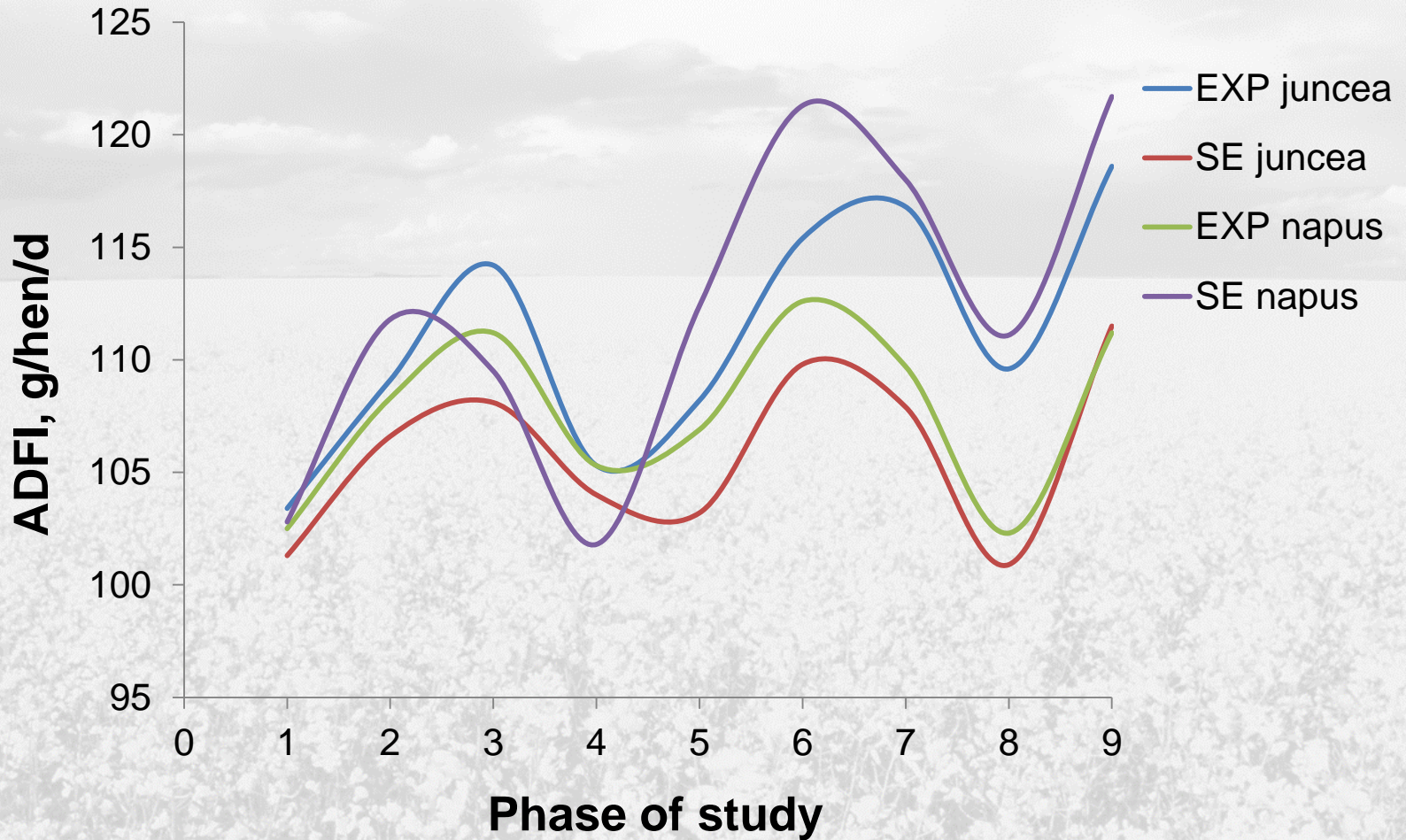
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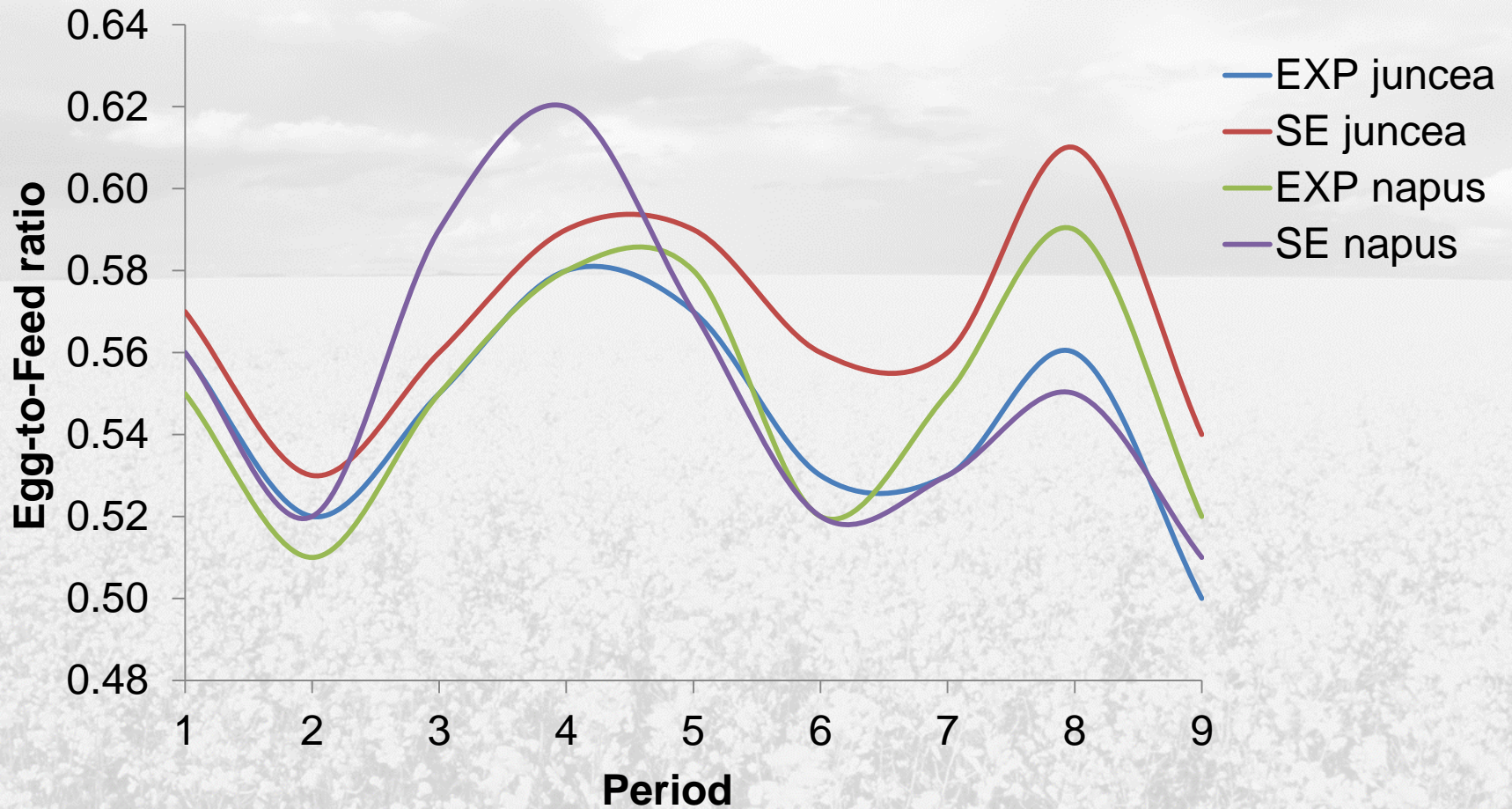
Bird weight



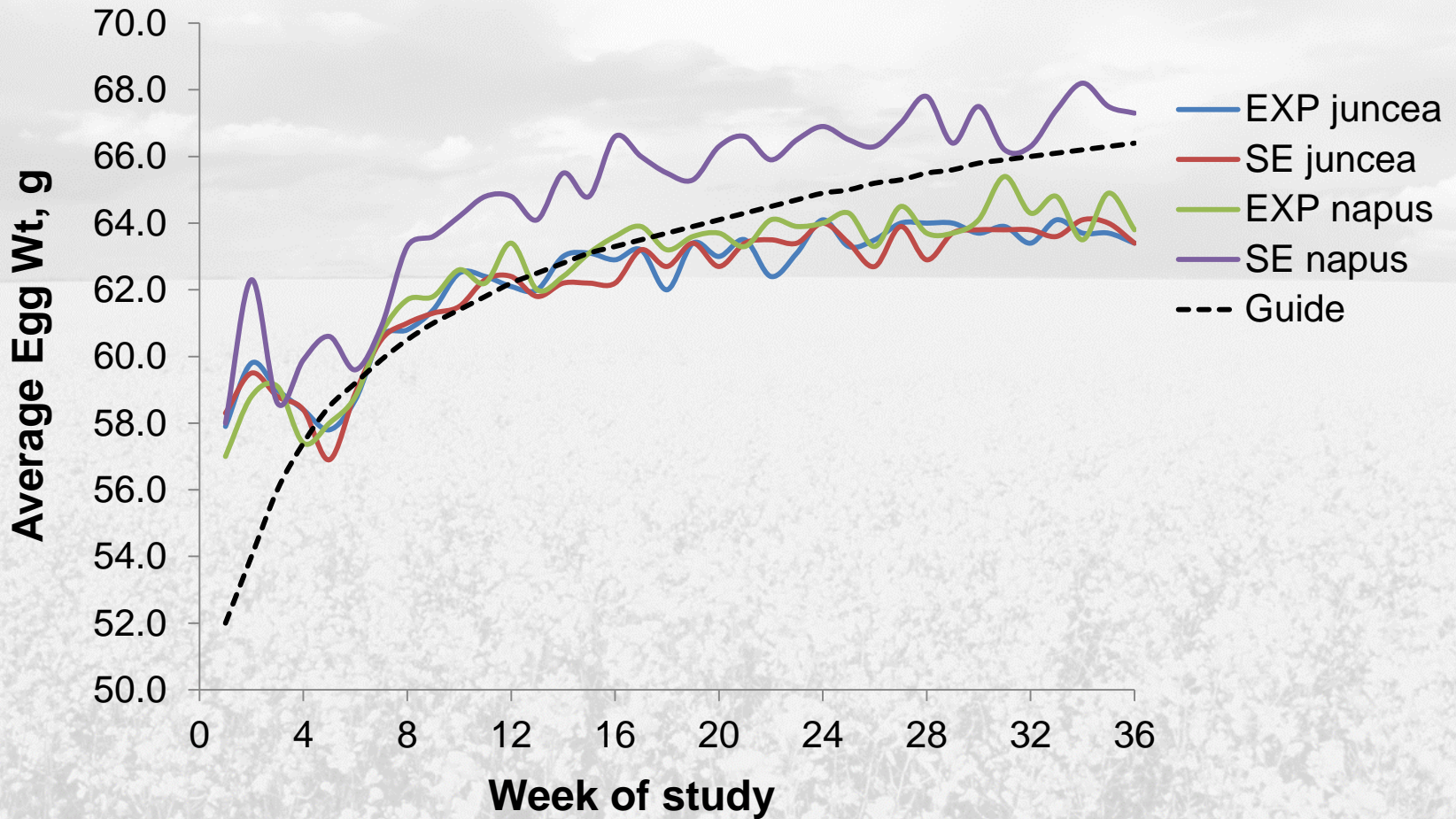
Average Daily Feed Intake



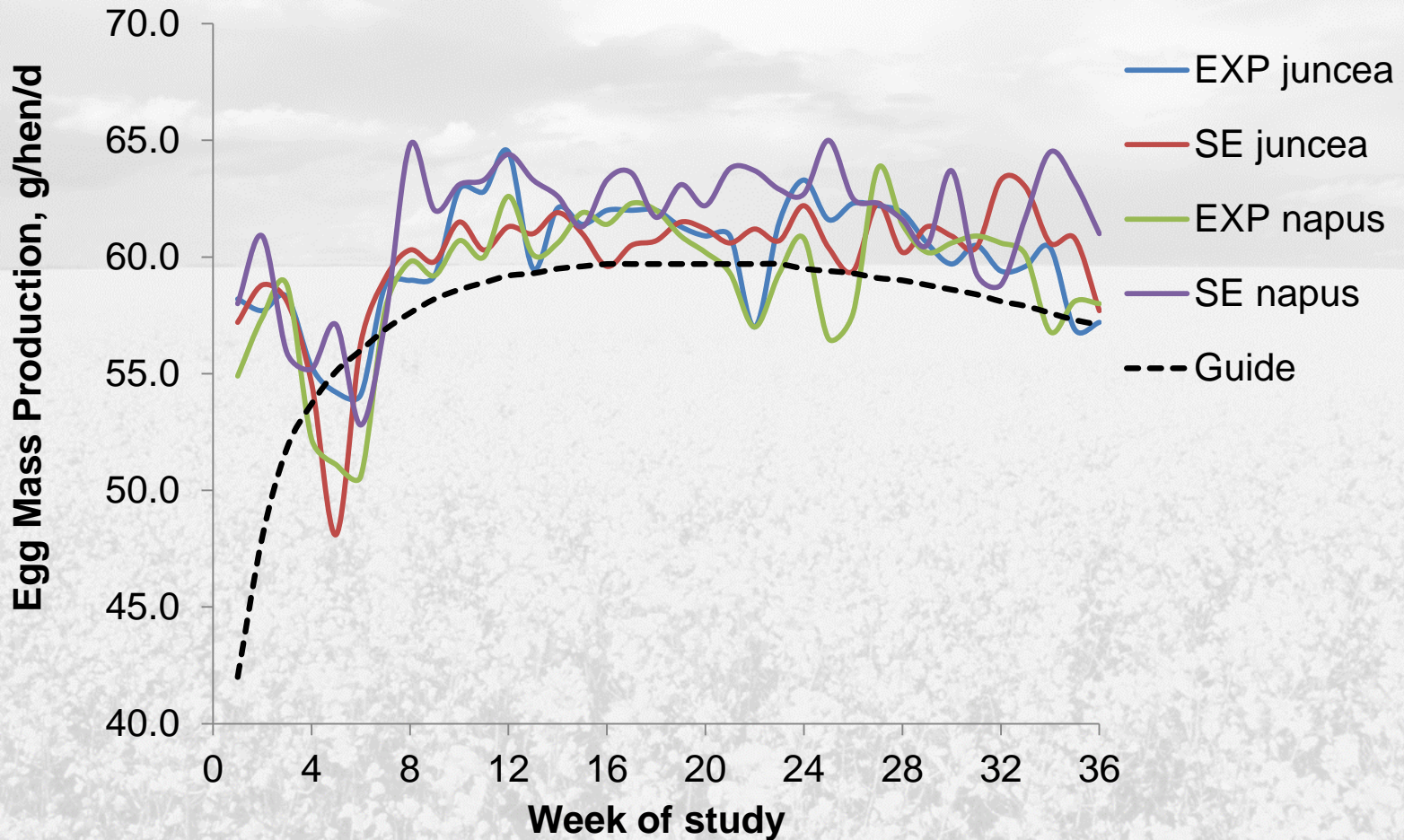
Egg-to-Feed ratio



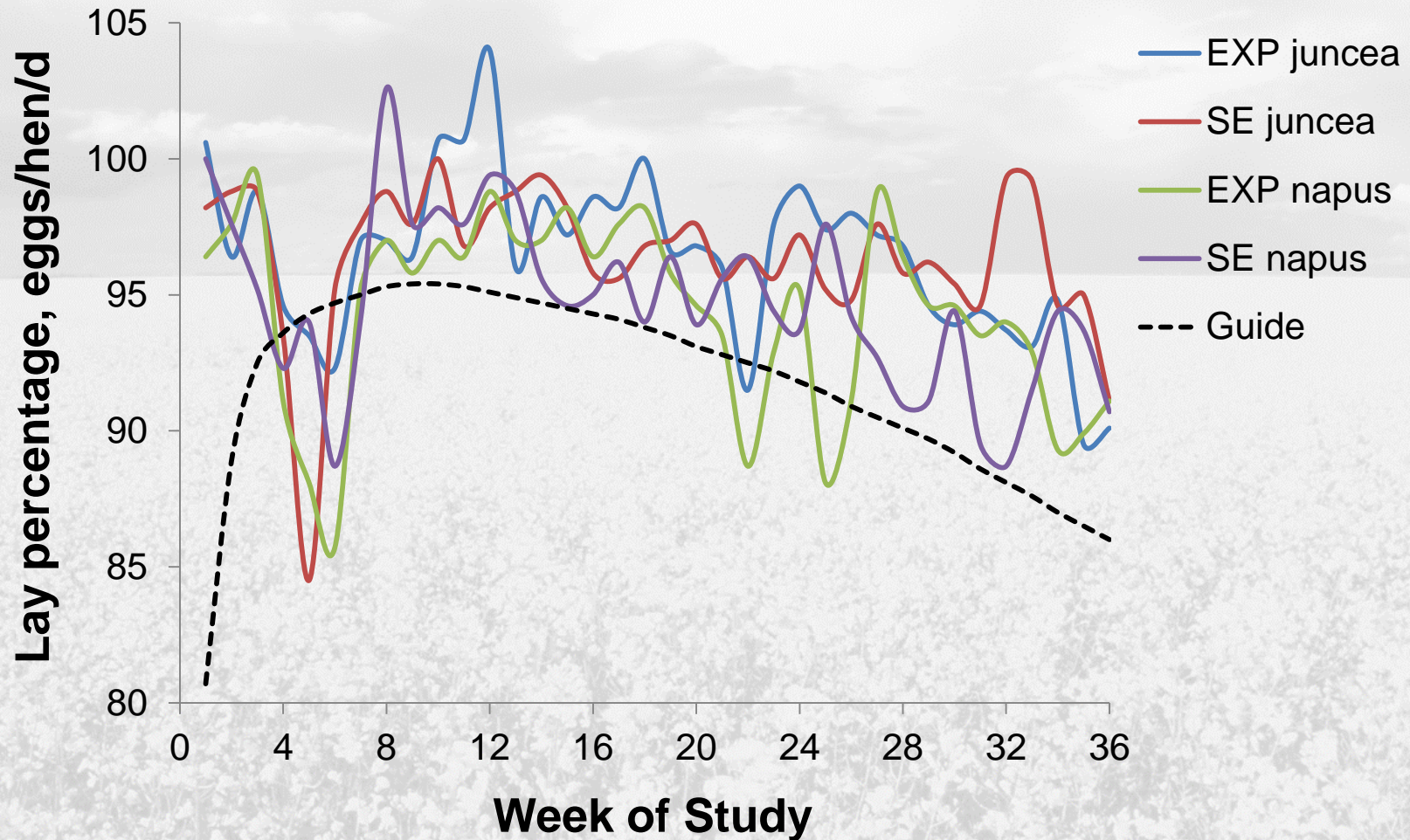
Average egg weight



Egg mass production



Lay percentage



Egg components and quality

	<i>B. juncea</i>		<i>B. napus</i>		SEM	<i>P</i> - values	
	EXP	SE	EXP	SE		Species	Type
Weights, g							
Intact egg	62.4	63.4	64.0	66.2	1.1	0.054	0.145
Albumen	37.2	38.1	39.1	40.2	0.8	0.022	0.201
Shell	8.5	8.6	8.4	8.8	0.2	0.709	0.230
Yolk	16.7	16.7	16.5	17.2	0.3	0.515	0.243
Weights, % intact egg							
Shell	13.66	13.51	13.24	13.33	0.25	0.179	0.984
Albumen	59.49	60.03	60.89	60.63	0.41	0.016	0.695
Yolk	26.71	26.31	25.92	25.99	0.34	0.097	0.704
Egg quality measures							
Specific gravity	1.093	1.086	1.093	1.091	0.002	0.242	0.081
Albumen height, mm	10.47	8.98	9.12	9.20	0.75	0.703	0.510
Albumen pH	8.25	8.23	8.39	8.27	0.06	0.171	0.267
Yolk pH	6.27	6.26	6.45	6.26	0.08	0.257	0.223



Whole egg fatty acids

% of total FA	B. juncea		B. napus		SEM	P - values	
	EXP	SE	EXP	SE		Species	Type
Saturated fatty acids	27.44	27.09	27.00	27.37	0.18	0.653	1.000
Monounsaturated fatty acids	53.91	53.33	53.94	54.00	0.28	0.103	0.274
Polyunsaturated fatty acids	16.70	17.07	16.87	16.44	0.26	0.401	0.885
Linolenic acid (C18:3n-3)	1.44	1.43	1.28	1.22	0.04	0.001	0.341
Clupanodonic acid (C22:5n-3)	0.17	0.14	0.19	0.19	0.02	0.075	0.335
DHA (C22:6n-3)	1.74	1.73	1.80	1.81	0.04	0.101	0.932
Total omega-3	3.37	3.38	3.33	3.28	0.05	0.215	0.690
Total long-chain omega-3	1.93	1.95	2.05	2.07	0.04	0.006	0.740
Omega-6:omega-3	3.96	4.06	4.07	4.02	0.06	0.531	0.695



Take home messages

- Layer performance approached or exceeded expectations for all treatments
 - Virtually no mortality (2 birds)
- Separate matrix values for juncea vs. napus warranted?
 - Data do not suggest differences
- Acceptable egg quality for all treatments
 - TMA in yolk (in progress)



Digestible nutrient matrices assumed for meals in this study

	Extruded-Expelled meal	Solvent-Extracted meal
Crude Protein	33.33	39.21
AME, Mcal/kg	2.75	2.20
Digestible CP	24.47	28.39
Calcium	0.51	0.60
Av. phosphorus	0.33	0.39
AID Arginine	1.73	1.84
AID Isoleucine	1.04	1.04
AID Lysine	1.34	1.46
AID Methionine	0.56	0.61
AID Met + Cys	1.09	1.17
AID Threonine	0.94	1.04
AID Tryptophan	0.32	0.36
AID Valine	1.34	1.33

