



Effect of trace mineral supplementation on the reproductive performance of lactating dairy cows

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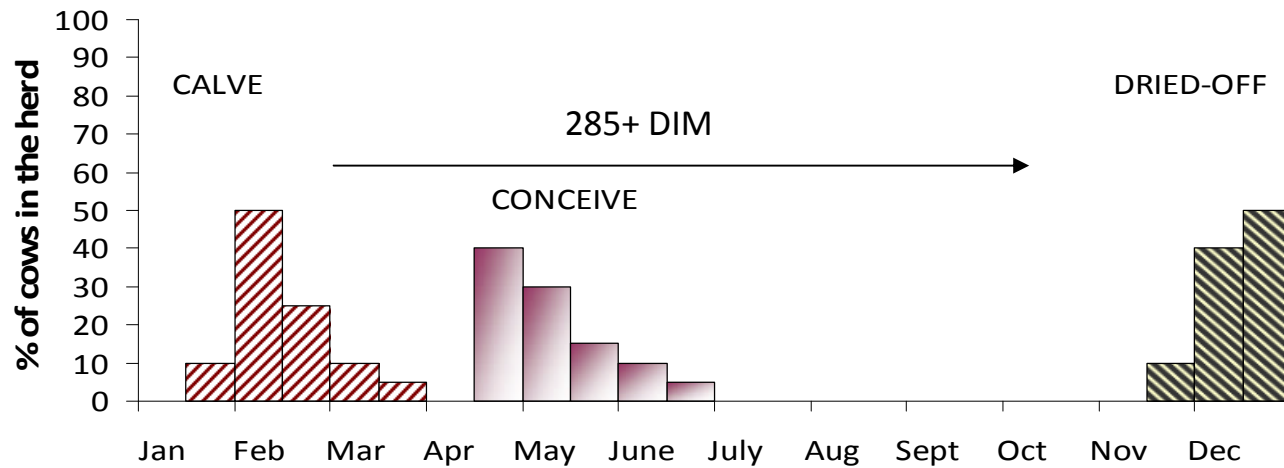
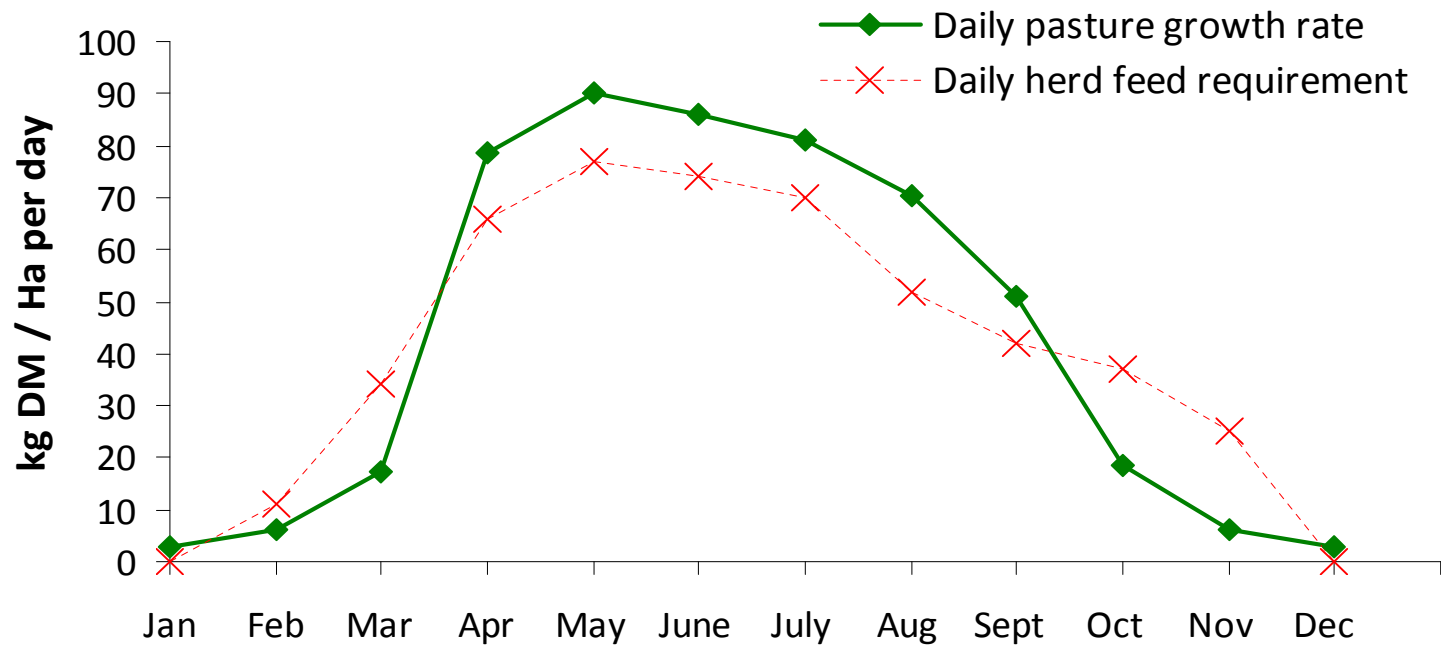
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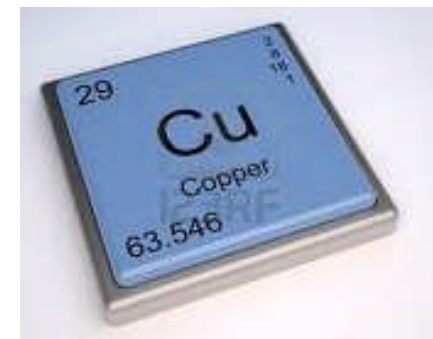
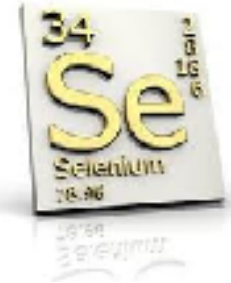
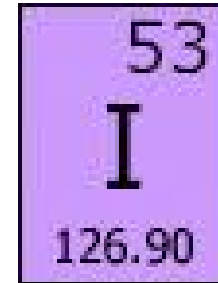
The Irish Agriculture and Food Development Authority

Seasonal, pasture-based milk production



Background

- Mineral deficiencies in grass
 - depending on region
 - season
 - fertilization strategy
- Mineral deficiencies in cattle
 - pasture deficient or imbalanced
 - concentrate supplementation reduced
- Minerals are essential
 - growth
 - reproduction
 - lactation



Main Mineral Deficiency Problems

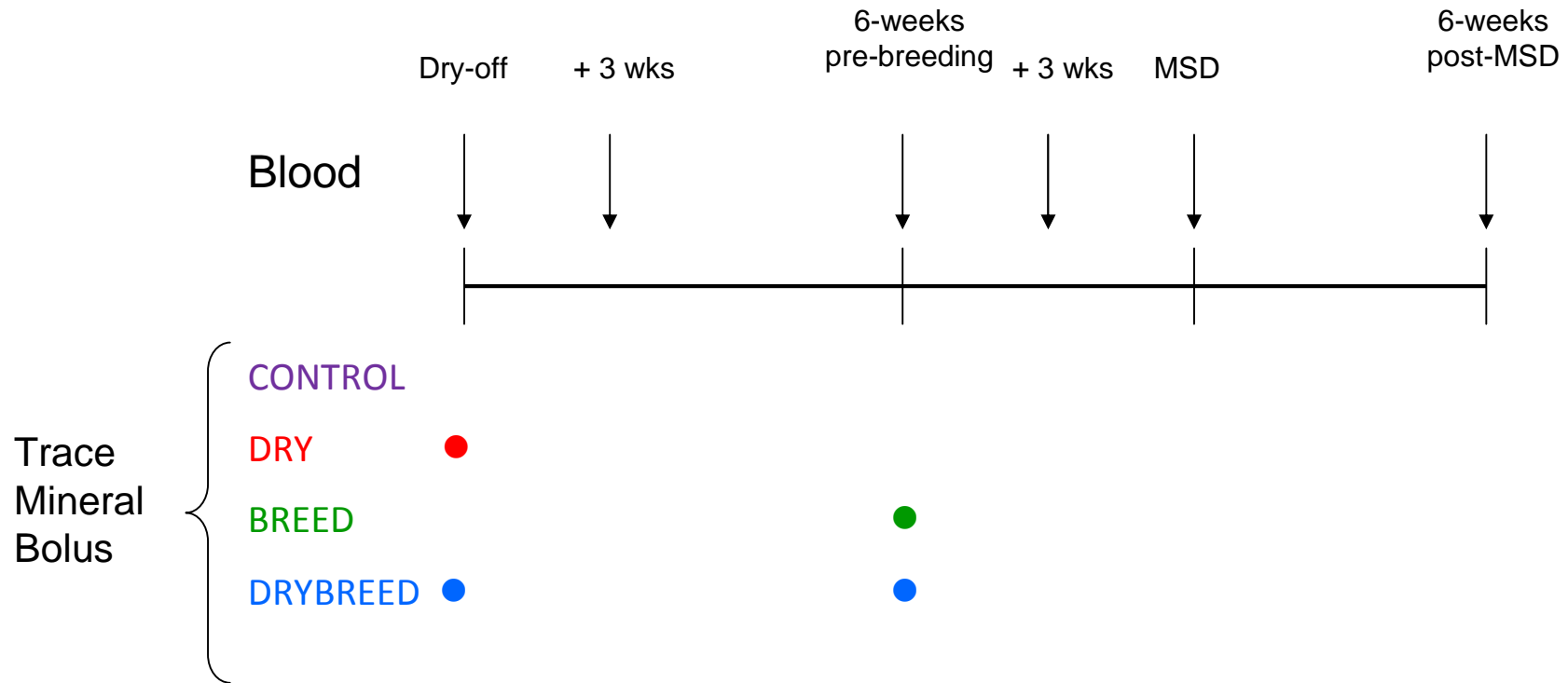
Copper	<ul style="list-style-type: none">-Poor fertility-Retained placenta-Compromised immune system
Selenium	<ul style="list-style-type: none">-Retained placenta-Metritis-cystic ovaries, anoestrous-foetal abortions, weak stillborn calves-White muscle disease in newborns
Iodine	<ul style="list-style-type: none">-Retained placenta-irregular or suppressed oestrus-early embryonic death-abortion, stillbirths.-Blind, hairless, weak or dead calves-Goitre; apparent in newborn before the adult

Materials



- 5 farms involved
 - 2 Teagasc research farms
 - 3 commercial farms
 - All farms in the South of Ireland
- 1,381 cows
 - 1,311 retained for data analysis
- Herd size 140-500 cows
- Grass samples collected in April, May and June for mineral analysis

Methods



- 10 cows/treatment/farm sampled
- Bloods analysed for Cu, Se and I
- Ultrasound scanning 35-40 post breeding season
- Reproduction variables calculated

Animax AllSure Bolus composition

- Cows <550 kg → 1 bolus
- Cows ≥550 kg → 2 boluses

	mg/bolus	mg/day (180 days)	Approx req. mg/day**
Copper oxide*	30,000	167	150
Iodine	3,400	19	6.75
Cobalt	525	2.9	2.06
Selenium	500	2.8	4.5

*Normally poorly available. Cu oxide needles in reticulum does provide coverage

**Lactating cow eating 15 kg DM/day

Statistical Analyses

- Blood trace mineral concentration data
 - checked for normality
 - mixed model repeated measure procedures in SAS
- Fixed effects
 - treatment
 - time
 - treatment × time
 - parity
 - farm
- Cow included as random effect
- Binary reproductive variables analysed using Chi-square test

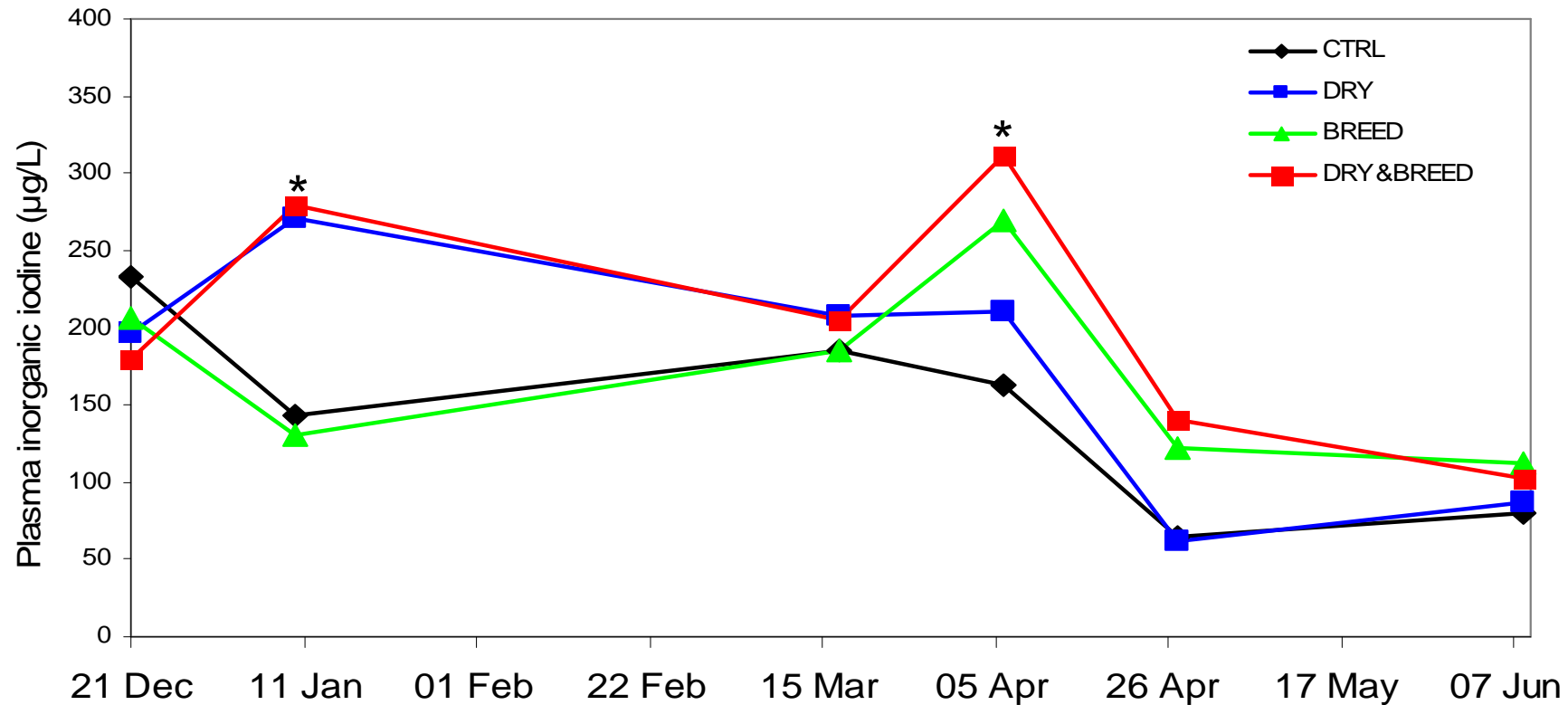
Herbage Trace Mineral Profile

	Co mg/kg	Cu mg/kg	I mg/kg	Se mg/kg
Requirements	0.11	10	0.5	0.3
North Cork	0.09	9.1	0.26	0.08
North Cork	0.11	8.7	0.22	0.06
West Cork	0.08	8.5	0.19	0.08
West Waterford	0.15	10.6	0.23	0.13
South Tipperary	0.06	9.2	0.20	0.05

Requirements from NRC (2001)

Plasma Inorganic Iodine

Overall effect of treatment - $P < 0.001$

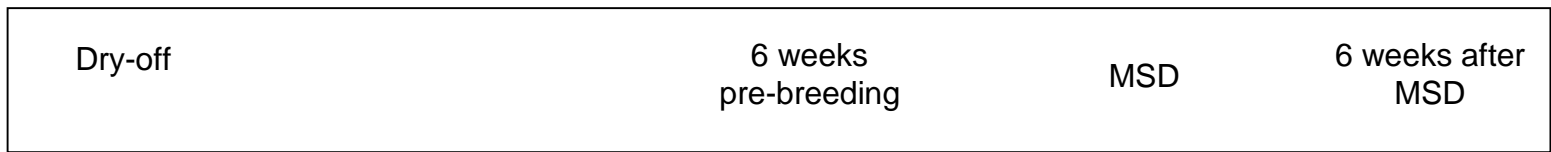
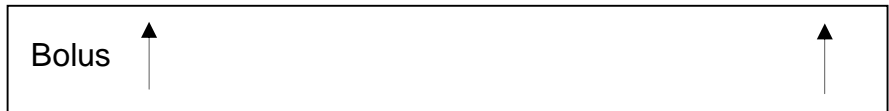
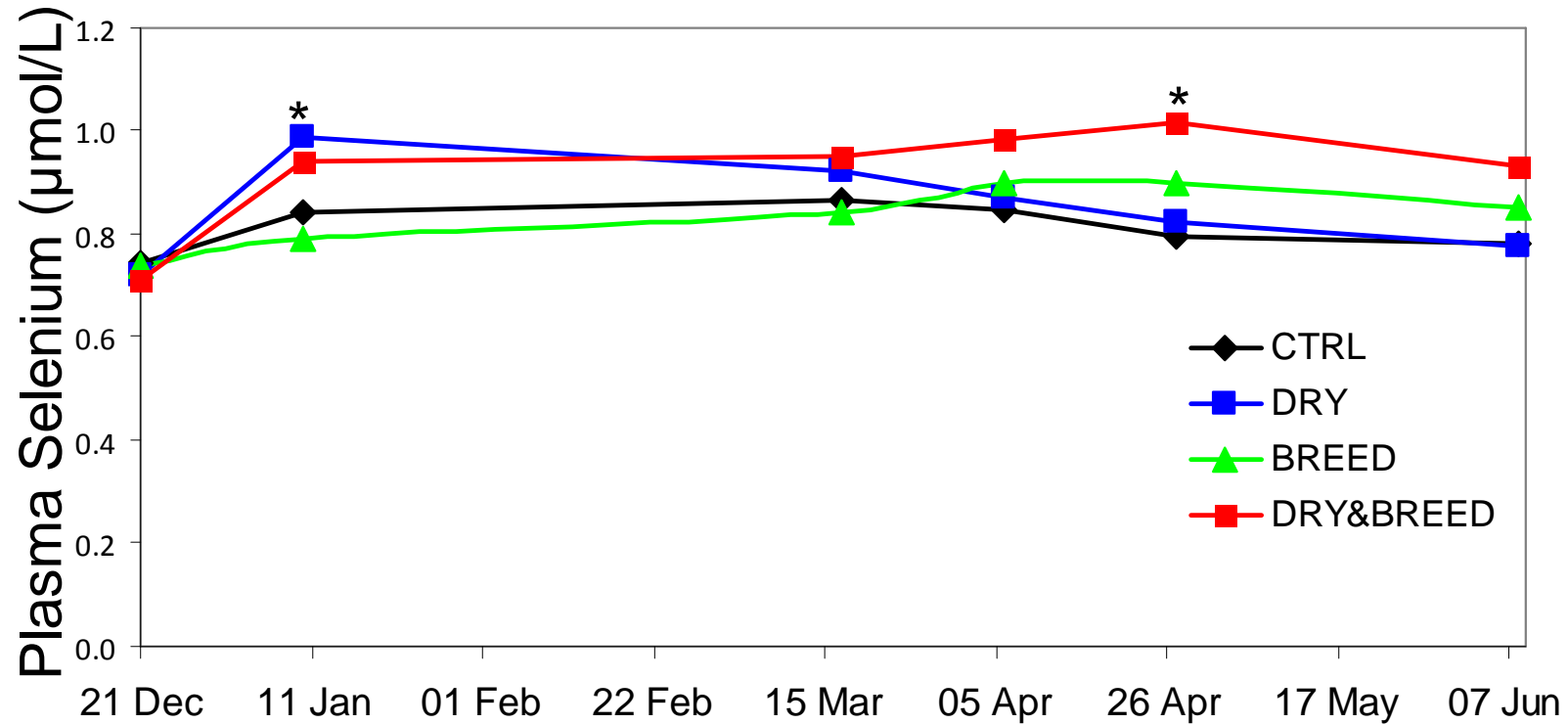


Bolus: ↑ ↑

Dry-off 6 weeks pre-breeding MSD 6 weeks after MSD

Plasma Selenium

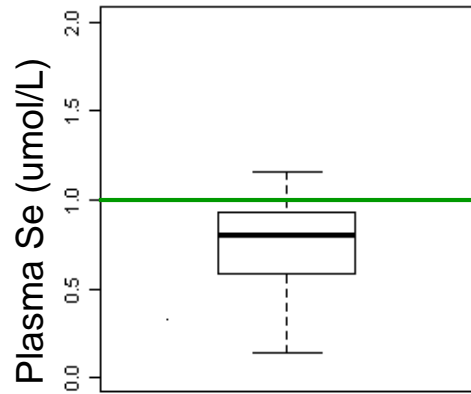
Overall effect of treatment - P=0.03



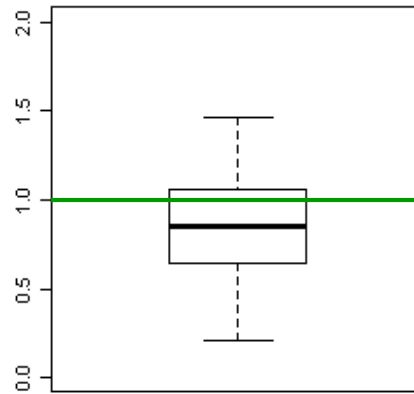
Effects of TM bolus on reproduction variables.

	CTRL	DRY	BREED	DRY_BREED	P-value
n	352	340	335	339	-
21 day submission rate	80.4	82.0	78.5	79.3	0.7
Pregnancy rate to first AI	51.0	52.4	53.3	53.7	0.9
42 day pregnancy rate	66.1	65.9	64.2	70.7	0.3
Final pregnancy rate	86.3	87.0	88.0	87.9	0.9

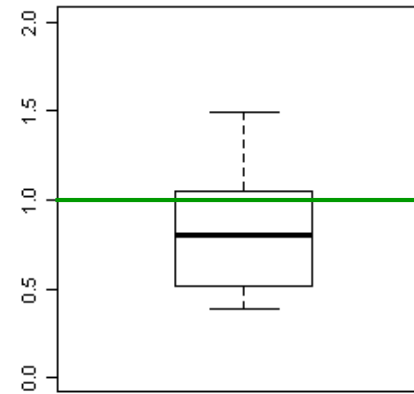
Se & I status of CTRL cows



Dec

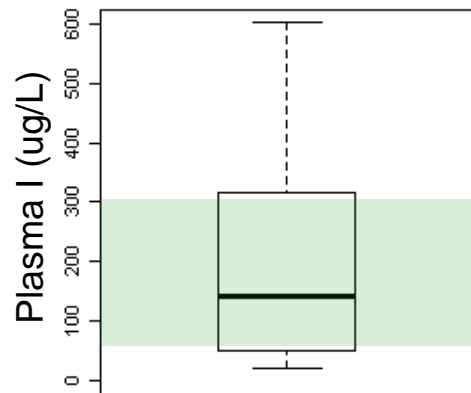


Mar

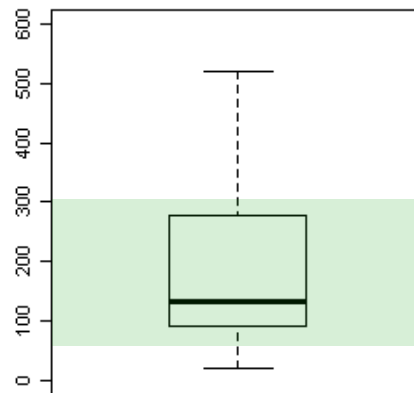


May

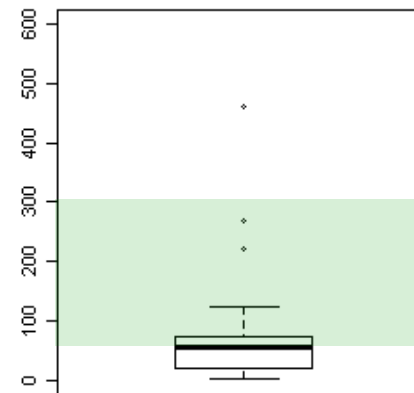
Normal range >
0.2 – 4.2 uM/L
65% of samples
< 1uM/L



Dec



Mar



May

Normal range
60-300ug/L
May 56%
<60ug/L

Summary and Conclusions

- Evidence of sub-clinical deficiency
 - Grass
 - Blood
- Plasma I and Se increased for variable periods of time.
- Trace mineral bolus supplementation
 - no effect on herd reproductive performance:
 - herds without clinical deficiency symptoms
 - conc fed until ~3 wks before MSD.

Acknowledgments



Department of
**Agriculture,
Food and the Marine**
An Roinn
**Talmhaíochta,
Bia agus Mara**



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Questions?

