Factors affecting semen quantity and quality of dairy bulls raised under Thai tropical conditions

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Importance of Artificial Insemination in Dairy Farming

China

India

Myanmar

Laos

Thailand

Vietnam

Cambodia

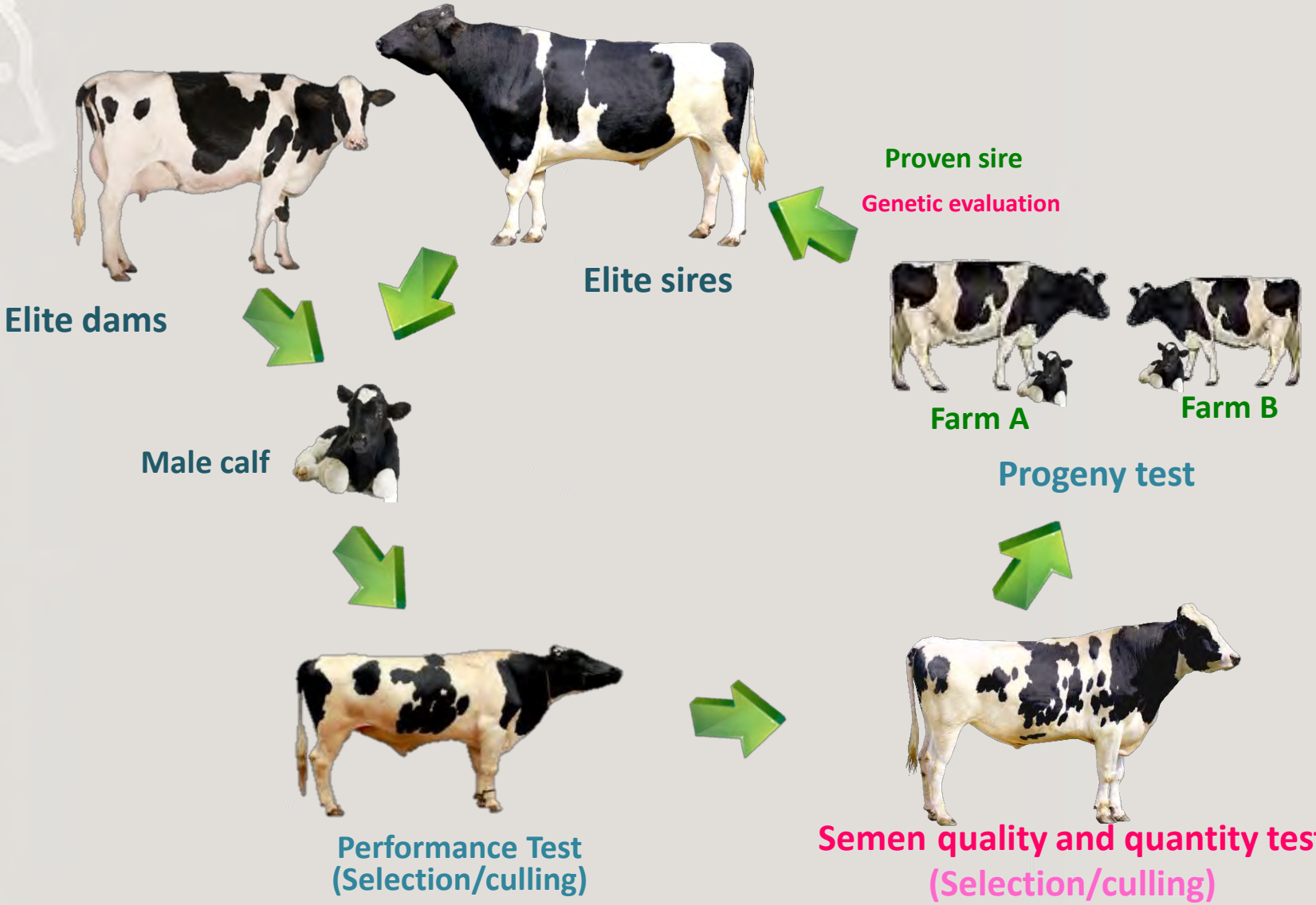
Malaysia

Thai Holstein

Imported semen

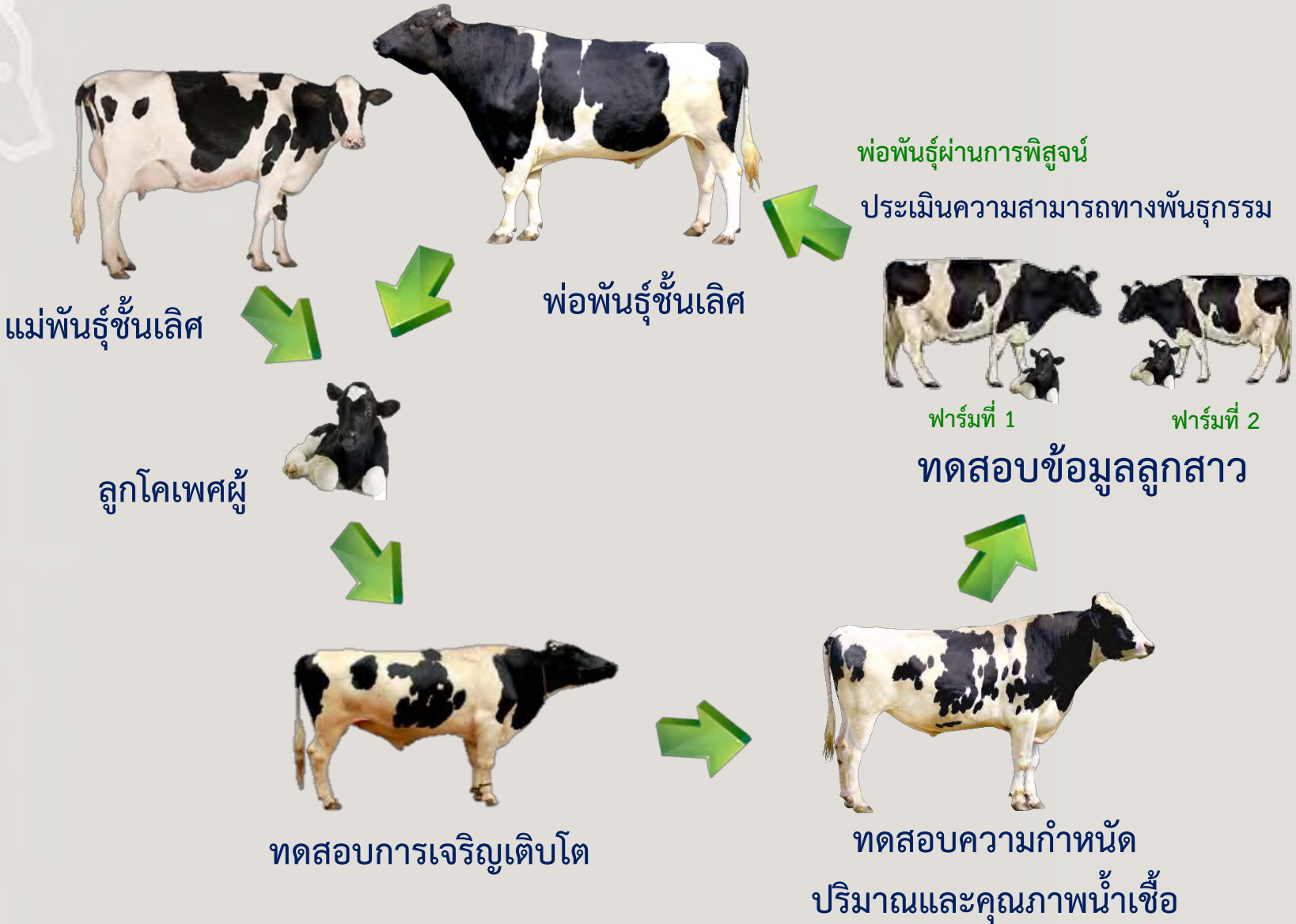
Source: Koonawootrittriron (2016); Kongnoi *et al.* (2010)

Dairy genetic evaluation



Source: Sarakul *et al*. (2017); Koonawootrittriron (1997)

Dairy genetic evaluation



Factor affecting semen production

Semen quantity

Genetic

Management

Breed

Environment

Age

Others

Semen quality

Source: Koonawootrittriron (1997); Mathevon *et al.* (1998); Kongnoi *et al.* (2010)

Objective

To study factors affecting semen quantity and quality of dairy bulls raised under Thai tropical conditions

Dataset

- **Pedigree**
  - 130 dairy bulls
  - 62.5 to 100%H
- **Semen production**
  - 11,121 records
  - 2001 to 2015

- Volume (VOL)
- Appearance (APP)
- Abnormal sperm (ABN)
- Concentration (CON)
- Active motile sperm (MOT)

Housing and management

Semen collection

Semen collection

Evaluation of semen quality

Freezing stallion semen

Statistical model

$$y = Xb + Zu + Wpe + e$$

Fixed effects

- Year-month of semen collection
- Heterosis(covariate)
- Ejaculation number (1, 2)
- Age of bull (1 to 10)
- Ambient temperature (1 to 8)

Random effects

- Animal
- Permanent environment
- Residual

Descriptive statistic

Traits	N	Means	SD	Min	Max	Mode
VOL (ml)	11,121	5.87	1.82	2.50	12.00	5.00
APP (score)	11,104	2.57	0.76	1.00	4.00	2.00
CON ($x10^6$/ml)	9,745	1,052.94	161.49	700.00	1,400.00	1,000.00
ABN (%)	11,161	11.98	2.99	10.00	20.00	10.00
MOT (%)	10,090	49.98	11.06	30.00	80.00	50.00

Results and Discussion

P-value of the consider factors for semen quality and quantity

Traits	Year-month	Ejaculation	Age	Temp	Heterosis
VOL	<0.01	<0.01	<0.01	0.35	0.08
APP	<0.01	<0.01	<0.01	0.28	0.76
CON	<0.01	<0.01	<0.01	<0.01	0.86
ABN	<0.01	<0.01	<0.01	<0.01	0.56
MOT	<0.01	<0.01	<0.01	<0.01	0.83

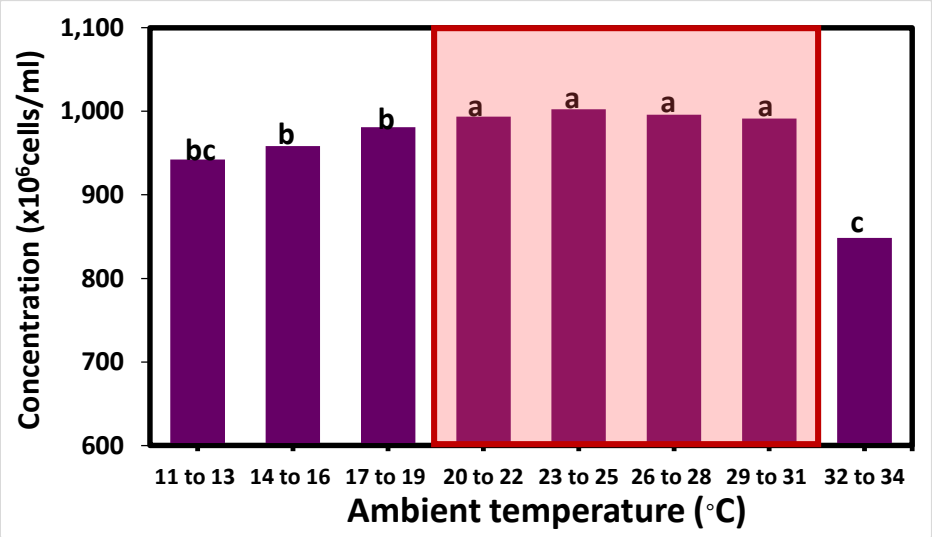
Ejaculation number

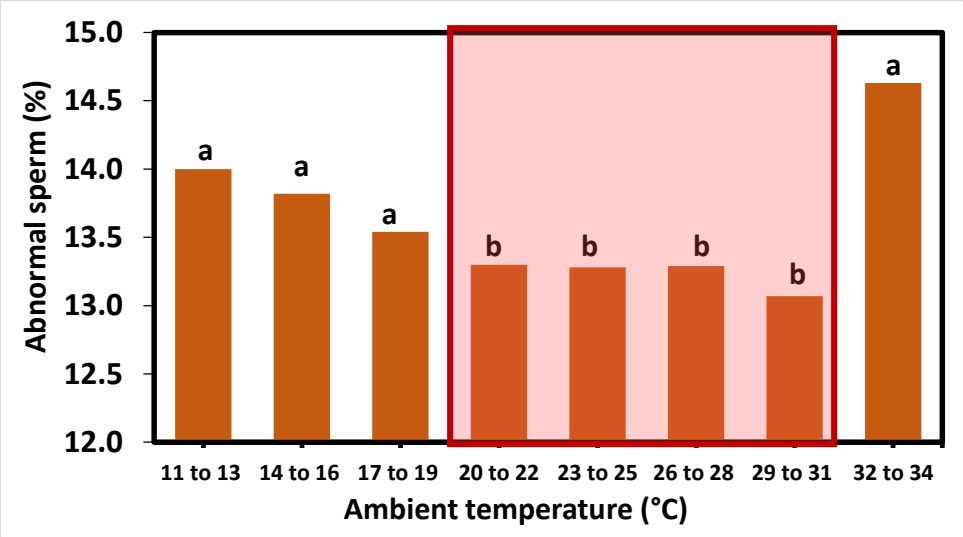
Traits	First	Second
VOL (ml)	4.98 ± 0.11	6.27 ± 0.12
APP (score)	2.53 ± 0.04	2.34 ± 0.05
CON ($x10^6$/ml)	998.30 ± 12.13	930.07 ± 12.87
ABN (%)	13.04 ± 0.25	14.19 ± 0.26
MOT (%)	46.62 ± 0.82	42.35 ± 0.87

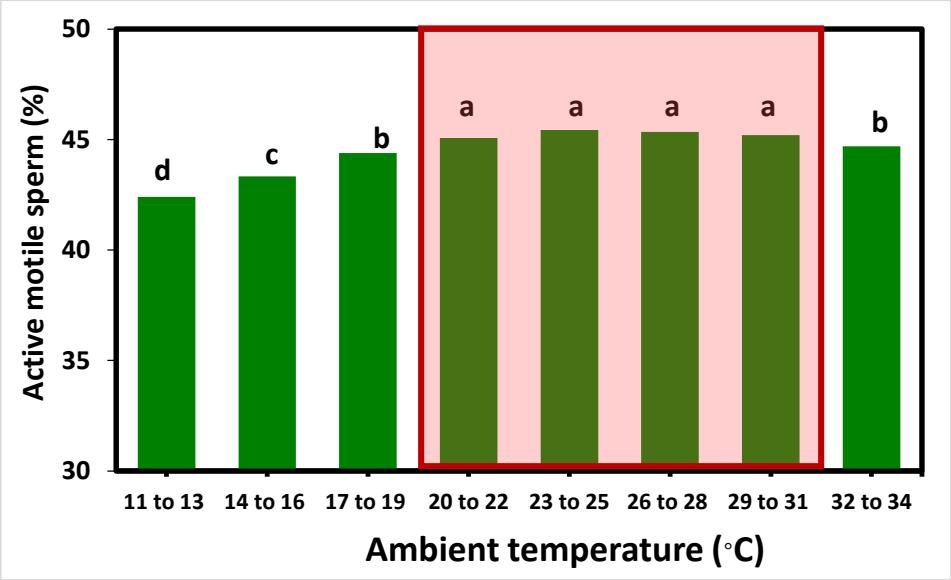
Age of bull

Age (month)	VOL (ml)	MOT (%)	APP (score)	CON ($x10^6$/ml)	ABN (%)
10-16	4.99 ± 0.21^{d}	42.28 ± 1.32^{b}	2.47 ± 0.08^{b}	939.90 ± 20.15^{c}	14.00 ± 0.38^{a}
>16-18	4.63 ± 0.35^{d}	39.64 ± 2.09^{c}	2.30 ± 0.13^{b}	915.17 ± 32.69^{c}	14.99 ± 0.57^{a}
>18-20	5.10 ± 0.29^{d}	43.61 ± 1.69^{bc}	2.37 ± 0.10^{b}	954.12 ± 26.40^{bc}	13.78 ± 0.47^{a}
>20-22	5.15 ± 0.27^{cd}	44.39 ± 1.66^{b}	2.27 ± 0.10^{b}	972.84 ± 26.10^{b}	13.50 ± 0.45^{a}
>22-24	5.47 ± 0.23^{c}	43.71 ± 1.39^{bc}	2.38 ± 0.09^{b}	959.30 ± 21.15^{bc}	13.48 ± 0.40^{a}
>24-36	5.72 ± 0.11^{b}	46.41 ± 0.84^{a}	2.54 ± 0.05^{a}	990.92 ± 12.35^{a}	13.14 ± 0.25^{b}
>36-48	6.11 ± 0.10^{b}	45.89 ± 0.77^{a}	2.53 ± 0.04^{a}	977.63 ± 11.23^{a}	13.25 ± 0.23^{b}
>48-60	6.29 ± 0.10^{ab}	46.28 ± 0.76^{a}	2.50 ± 0.03^{a}	984.93 ± 10.94^{a}	13.18 ± 0.23^{b}
>60-72	6.35 ± 0.10^{a}	46.66 ± 0.77^{a}	2.49 ± 0.04^{a}	983.39 ± 11.16^{a}	13.20 ± 0.23^{b}
>72	6.43 ± 0.11^{a}	46.00 ± 0.84^{a}	2.47 ± 0.05^{a}	963.64 ± 12.11^{bc}	13.24 ± 0.25^{b}

Ambient temperature







Conclusions

- Semen quantity and quality varied by year-month, ejaculation number, age, ambient temperature at collection time

- Ambient temperature had no effect on VOL and APP
- Heterosis of the bulls had no effect on any traits

Bulls with age from >24 to >72 months produced favorable quality and quantity semen

Semen collection at the ambient temperature from 20 to 31°C had the best CON ABN and MOT

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Thank you
For your attention