Semen and Sperm Quality Parameters of Cockerels fed Dietary *Moringa Oleifera* Leaf Meal-Based Diet

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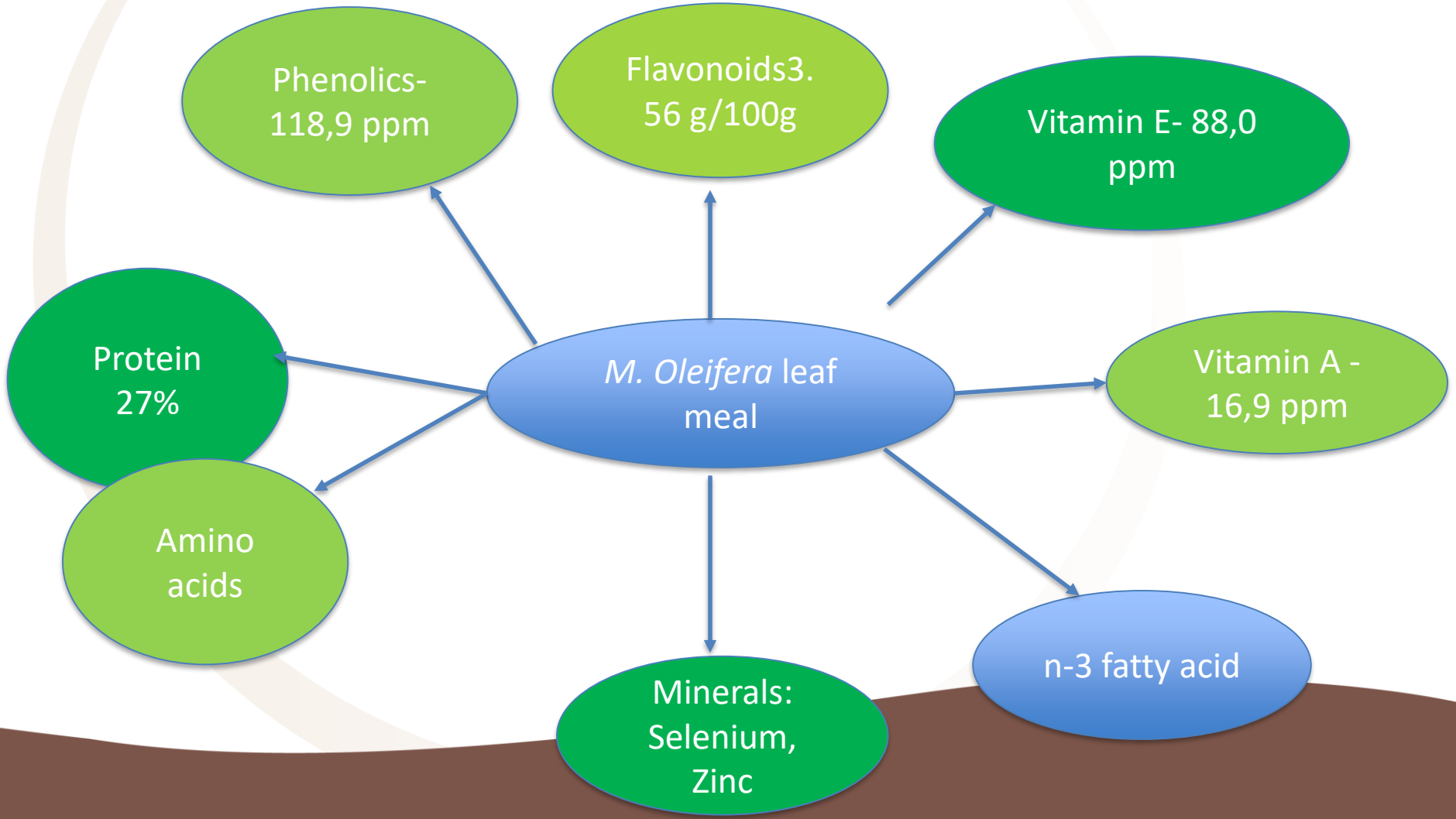
Background

- Growing interest in utilization of plant leaf meals as alternative feed ingredients to conventional feed resources
- Rising competition between man and livestock for existing food and feed resources
- Small holder farmers in developing countries have long opted to utilising plant material as feed resources.
    - Shortage of feed results in impaired productivity and reproduction performance of livestock.
- Escalating prices of feed ingredients
    - Due to ongoing climate change

- Poor nutrition is identified as a constrain hindering fertility of livestock in developing countries
  - Recently, plant leaf meals & extracts have gained interest in animal feed strategies e.g Moringa oleifera

    - Plant materials are used in ethnomedicine because of their beneficial properties in enhancing male fertility
- Many nutrients and their deficiencies influence fertility in livestock.
  - Study aimed at investigating the effect of MOLM diet on semen and sperm traits of cockerels

Why Moringa oleifera



ARTICLES FROM MORINGA PROJECT

- **1.** N. A. Sebola, V. Mlambo and H. K. Mokoboki. 2017. Chemical characterisation of Moringa oleifera leaves and apparent digestibility of the leaf meal-based diets in three chicken strains. Agroforestry Systems. DOI 10.1007/s10457-017-0074-9
- **2.** N. A. Sebola., Mlambo, V., Mokoboki, H. K., Muchenje, V. 2015. Growth performance and carcass characteristics of three chicken strains in response to incremental levels of dietary Moringa oleifera leaf meal. Livestock Science 178: 202 – 208.
- **3.** N. A. Sebola, V. Mlambo, H. K. Mokoboki, A. Hugo, and V. Muchenje. 2018. Comparison of meat quality parameters in three chicken strains fed Moringa oleifera leaf meal-based diets. Journal of Applied Poultry Research. http://dx.doi.org/10.3382/japr.

Materials and methods

NWU Experimental Farm ;
MO harvested in LP

Leaves, air-dried at a room temperature; Milled
Two diets: MOLM0 & MOLM7%;
isonitrogenous and isoenergetic

-40 PK cockerels were raised on starter mash for 4weeks;
-Randomly allotted to 2 Exp. Diets until 42 weeks
In CRD

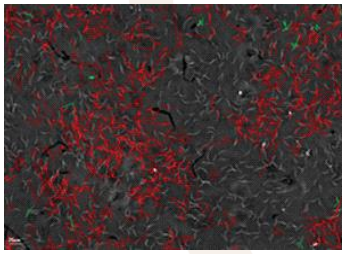
-Dorso-abdominal massage;
-day interval between 9:00 and 11:00

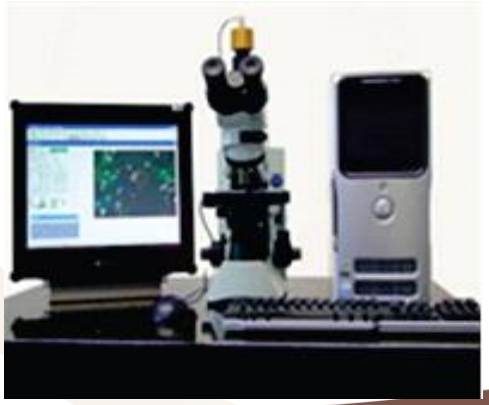
Gross composition of *Moringa oleifera* leaf meal (MOLM)-based experimental diets

	Treatment (g/kg)		
Ingredients	MOLM0	MOLM70	
MOLM (g/kg diet)	0	70.0	
Yellow maize	670.6	647.1	
Prime gluten 60	50.0	50.0	
Full fat soya meal	70.0	70.0	
Soya bean meal	85.3	58.2	
Sunflower oilcake	80.0	80.0	
Limestone powder	12.3	7.1	
Potassium carbonate	1.2	0.9	
Mono calcium phosphate	9.8	10.0	
Salt	3.2	3.15	
Soya oil	7.8	13.5	
Premix	6.8	6.8	
Lysine	2.7	2.7	
Methionine	0.3	0.7	
Total	1000	1000	
Chemical analysis of diets on an 'as fed basis (MOLM)	MOL		
Dry matter	896.0	851.0	950.8
Crude protein	189.0	189.0	263.4
Ether Extract	52.0	61.0	53.9
Ash	49.0	45.0	80.4
Acid detergent fibre	36.0	47.0	52.1
Neutral detergent fibre	96.0	106.0	761.7
Crude Fibre	36.0	34.0	54.9
Metabolisable energy (KCal/kg)	3157.6	3157.2	367.4
Lysine	9.7	9.7	
Methionine	4.0	4.3	

-Semen collected into 15 ml tube
- 200 µl of swim up media placed eppendorf tube and added 10µl of semen.
- 5 µl of solution was then used for CASA

- 5 µl Semen solution analysed using CASA;
- Motility, Progression, & Velocity
- pH
- Conc. spectrophotometer





Sperm Morphology

- 20µl of eosin stain and 7 µl of semen; 5 µl mixture analysed using
Florescene microscope
Total of 300 sperms per slide per replica per cock was used for morphology assessment

Statistical Analysis

- Daily semen collections (Volume, concentration, morphology and pH) were analysed using the repeated measures procedure of SAS (SAS, 2010)

$$Yij = \mu + Ti + Dj + (TxD)ij + Eij$$

- Motility parameters (VCL, VAP, VSL, VIN), sperm concentration; morphology data was analysed using GLM procedure of SAS

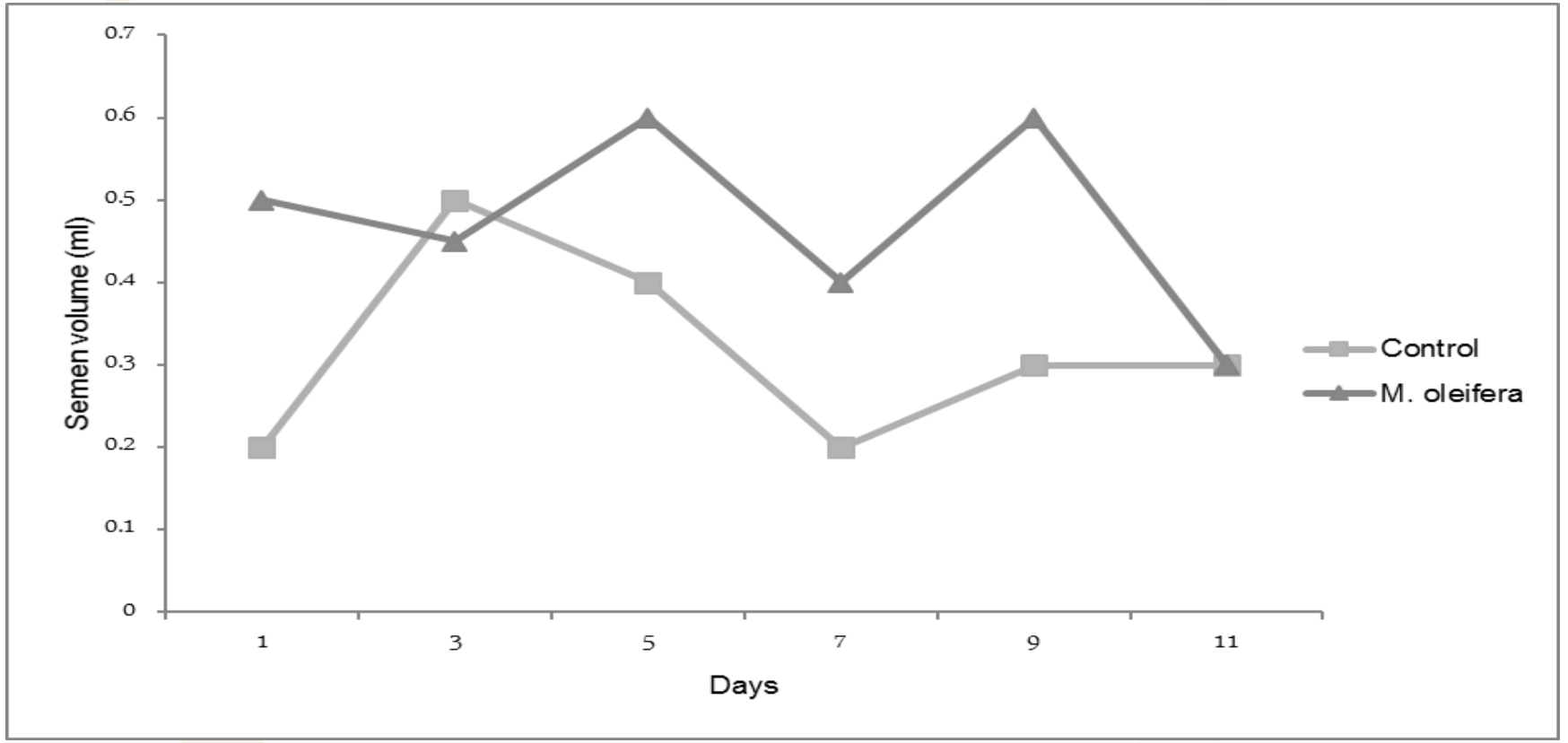
$$Yik = \mu + Ti + Eik$$

Results and discussion

Table 2 Analysis of dietary treatment, day and treatment x day effect on semen quality

Semen Characteristics		Treatment	Interaction	
			Day effect	Treatment x Day effect
Semen volume (ml)		NS	**	**
Sperm concentration (108 cells ml -1)		NS	NS	NS
pH		**	NS	NS
Morphology	Live	NS	NS	NS
	Dead	NS	NS	NS
	Mid	NS	NS	NS
	Tail	NS	NS	NS

Effect of collection period (day interval) on semen volume of chickens fed *Moringa oleifera* leaf meal



**P<0.05; NS, not significant

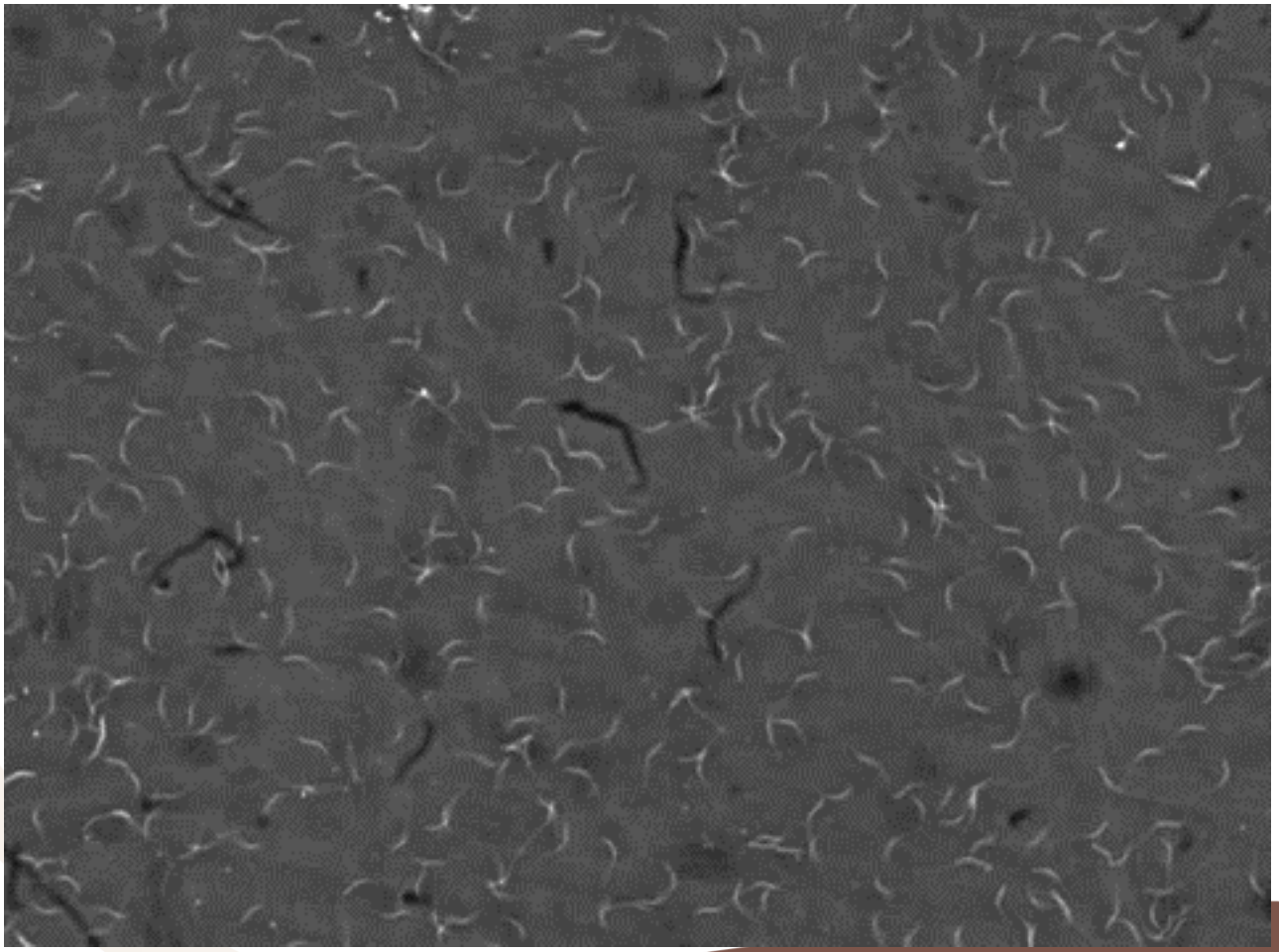
The semen characteristics of Potchefstroom Koekoek fed Moringa oleifera leaf meal (mean -/+ SEM)

Parameters		Treatment (g/kg)	
		MOLM0	MOLM70
Semen traits	Concentration(108 cells ml -1)	677.50 ± 0.041	719.19 ± 0.041
	pH	6.940 ± 0.120[b]	7.370 [a] ± 0.120
	Volume (ml)	0.39 ± 37.415	0.45 ± 37.415
	Sperm output	677.89±40.378	719.63 ± 40.378
Progression (%)	PM	39.38 ± 2.419[b]	57.73 [a] ± 2.419
	NPM	48.59 ± 1.279[a]	39.89 [b] ± 1.279
	Static	12.57 ± 2.156[a]	2.38 [b] ± 2.156
Velocity (%)	Rapid	81.27 ±2.497[b]	89.06 [a] ± 2.497
	Medium	55.84 ± 0.736	56.42 ± 0.736
	Slow	32.78 ± 0.743	32.86 ± 0.743
Motility	VCL (µm/s)	86.70 [b] ± 8.007	106.64 [a] ± 7.124
	VSL (µm/s)	34.42 [b] ± 3.370	45.54 [a] ± 2.999
	VAP (µm/s)	51.57 [b] ± 4.987	66.19 [a] ± 4.437
	Linearity (%)	39.93 ± 1.164	42.70 ± 1.035
	Straightness (%)	67.08 ± 1.057	68.83 ± 0.940
	Wobble (%)	59.29 ± 0.969	61.89 ± 0.863
Morphology	Live	80.08 ± 1.413	80.78 ± 1.413
	Tail	4.67 ± 0.411	3.67 ± 0.411
	Dead	12.86 ± 1.177	13.47 ± 1.177
	Mid	2.17 ± 0.270	1.67 ± 0.270

- Rosters offered MOLM70 resulted in improved pH (7.37)
- Rosters fed MOLM 70 g/kg resulted in higher (57.73) Progressive motility (PM) than control diet (39.38).
- This finding may be attributed to Vitamin E (113 mg) and Selenium (0.235 dpm)
- Control diet had higher Non progressive motility (NPM) and static of 48.59 and 12.57, respectively
- Moringa oleifera leaf meal diet resulted in higher ($P>0.05$) sperm velocity/rapid (89.06 %) than control diet.
- Also resulted in higher VCL (106.64 μm/s), VAP (66.19 μm/s) and VSL (45.54 μm/s) which have been highly correlated with fertility

- Also resulted in higher VCL (106.64 µm/s), VAP (66.19 µm/s) and VSL (45.54 µm/s) which have been highly correlated with fertility - in rats (Moore and Akhondi, 1996) and in boars (Holt et al., 1997).

- The improvement in quality of sperm cells observed be attributed to the enrichment of MOLM with fatty acids (45.70%) and Vitamin E (antioxidants).



Thank you

Define tomorrow.

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