Reducing Water Wastage by Growing and Finishing Pigs at Nipple Drinkers

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Background

- Water disappearance
  - 1.9 ~ 6.8 L/pig/d
  - = intake + wastage
  - Up to 60% of water wasted at nipple drinkers (Brooks, 1994)
- Water wastage related to large amounts of slurry produced on pig units

Background

- Causes of water wastage
  - Drinker type (nipple vs. bowl)
  - Drinker height
  - High flow rate (low drinking speed)
  - Group size
  - Pig size
  - Others (temperature, tail bites...)

Objectives

- To reduce water wastage while maintaining adequate water intake of pigs at nipple drinkers
  - Water intake, wastage and maximum intake rate (study 1)
  - Effects of nipple height and flow rate on water wastage (study 2)
  - To reduce water wastage by drinker management (study 3)

Experiment 1

- Animals
  - Six pens of 8 female pigs
  - Body weight, kg
    - Period 1 = 53 ± 4.9
    - Period 2 = 72 ± 5.5
  - One-space dry feeder (pelleted feed *ad libitum)*
  - One nipple drinker
- Housing
  - Partially slatted floor
  - Space allowance = 1.4 m^2 / pig
  - Room temperature = 20 ~ 23 ^oC

Facilities

- Test pens
  - 2 raised pens (1.4 m^2 / pig)
  - 60 cm above the floor
  - A nipple drinker connected with a water meter
  - Collecting basket below the drinker under the pen floor
- Thermal Environment
  - Temperature = 22 ± 1.2 ^oC
  - RH = 63 ± 7.7%

Drinker height and flow rate

- Height
  - 50 mm above the shoulder height of the smallest pig (Bill and Barber, 1990)
  - Shoulder height (Patheric, 1983)
    - SH (mm) = 150 * BW (kg) $^{0.33}$
- Flow rate (Carr, 1994)
  - 650 ± 14 mL / min (Period 1)
  - 1000 ± 65 mL / min (Period 2)

Data collection

- Water disappearance
  - On daily pen basis for 4 days
- Water wastage
  - On daily pen basis for 4 days
- Water intake
  - = (Disappearance – Wastage)
- Feed intake
  - Weighed in and weighed back on a pen basis

Data collection

- Maximum water intake rate
  - Determined after 4 h water deprivation
  - Accessed at two flow rates
    - 650 vs. 1300 mL/ min (period 1)
    - 1000 vs. 2000 mL / min (period 2)
  - Allowed to access water by 20 sec individually
- Water intake rate (mL/min)

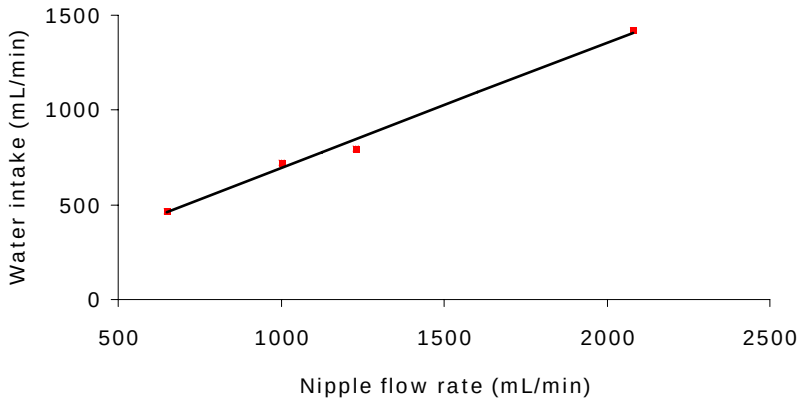
  = (disappearance – spillage) / drink time

Results

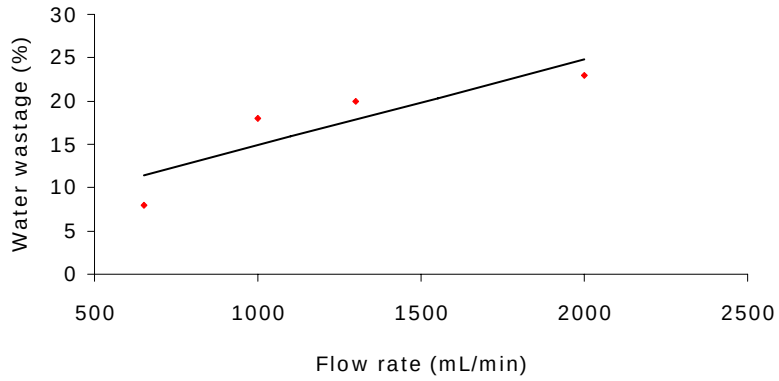
Water disappearance, intake and wastage by grow/finish pigs

	Growth period			
Item	Period 1	Period 2	SE	*P*
BW, kg	53 ± 4.9	72 ± 5.5	-	-
Disappearance, L	5.3	7.3	0.25	0.01
Wastage, L	1.3	1.9	0.11	0.01
Intake, L	4.0	5.4	0.19	0.01
Water : feed	2.4	2.1	0.12	0.18
Intake/BW, mL/kg	78	75	3.8	0.59
Wastage, %	**25**	**26**	**1.9**	**0.66**

Relation between water intake rate and drinker flow rate



Relation between water wastage and drinker flow rate



Experiment 2

- Animals
  - Four pens of 8 female pigs
  - Body weight
    - Grower period = 23 ± 2.7 kg
    - Finisher period = 68 ± 5.3 kg
- Housing as in Experiment 1
- Facilities as in Experiment 1

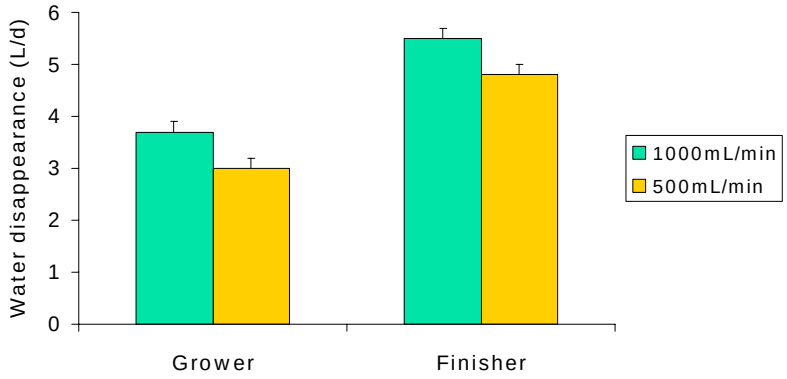
Drinker height and flow rate

- Height
  - Constant: 330 mm
  - Recommended (50 mm above shoulder height)
- Flow rate
  - 500 mL/min
  - 1000 mL/min

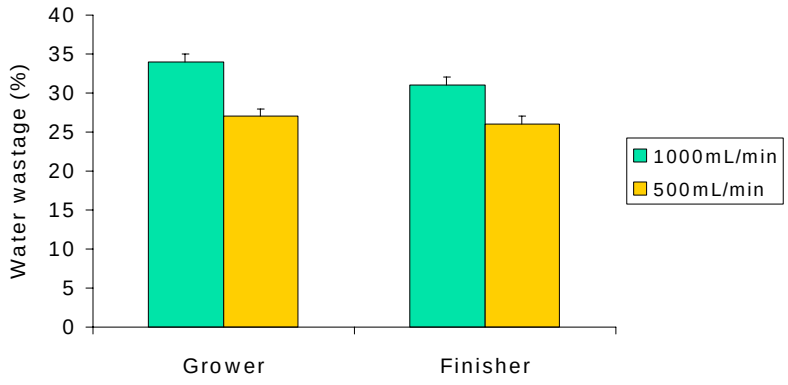
Data collection

- Water disappearance
- Water wastage
- Water intake
- Feed intake

Effect of drinker flow rate on water disappearance

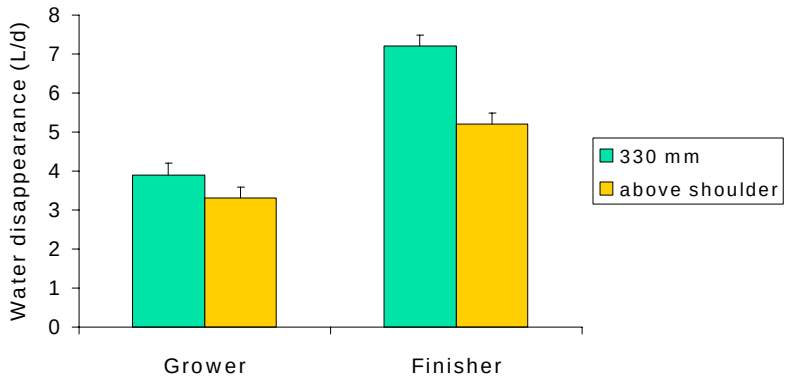


Effect of drinker flow rate on water wastage

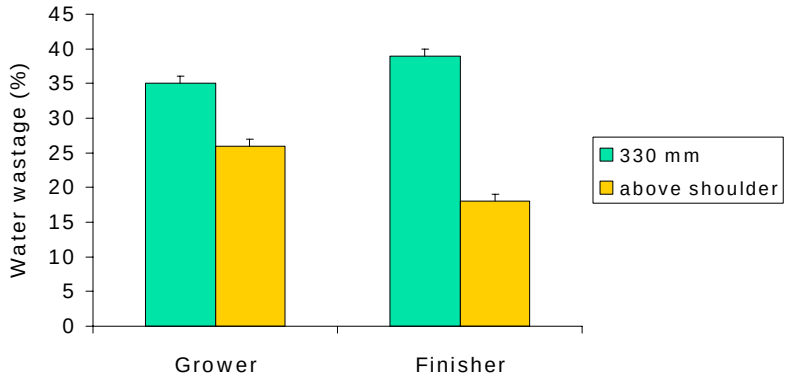


- The flow rates did not affect either water or feed intake

Effect of drinker height on water disappearance



Effect of drinker height on water wastage



- The drinker heights did not affect either water or feed intake

Experiment 3

- Animals
  - Sixteen pens of 18 pigs
    - 9 females and 9 males per pen
  - Body weight at start: 32 ± 4.5 kg
  - Dry mash diet *ad libitum*
- Housing
  - Fully slatted floor
  - Space allowance: 0.78 m^2 / pig
  - Room temperature: 18 ~ 25 ^oC

Drinker management

- Nipple drinkers
  - Constant low height (L-N)
    - 480 mm
  - 50 mm above the shoulder (S-N)
    - adjusted every 2 wk
  - Constant high height (Step)
    - 730 mm = 480 + 250 (Step)
- Bowl drinkers at 480 mm (B)

Flow rate = 1000 ± 42 mL /min

Data collection

- Performance
  - ADG (every 2 wk)
  - CV of weight
- Water disappearance
  - Daily pen basis
  - One water meter per pen
- Manure output
  - Weekly pen basis
  - Manure level in each individual pit

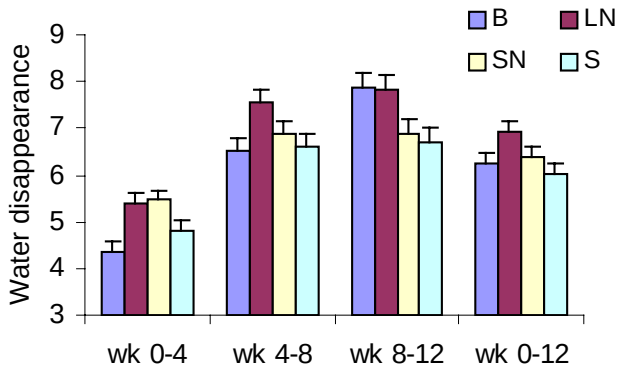
Effect of drinker management on body weight

Item	Bowl	L-N	S-N	Step	SE	*P*
No. Pen	4	4	4	4	-	-
Initial						
BW, kg	31.5	31.8	31.7	32.1	0.67	0.92
CV, %	13.3	16.3	14.5	12.8	1.21	0.23
Final						
BW, kg	104.2	106.0	102.9	104.0	1.98	0.74
CV, %	10.8	10.6	10.5	10.8	1.18	0.99

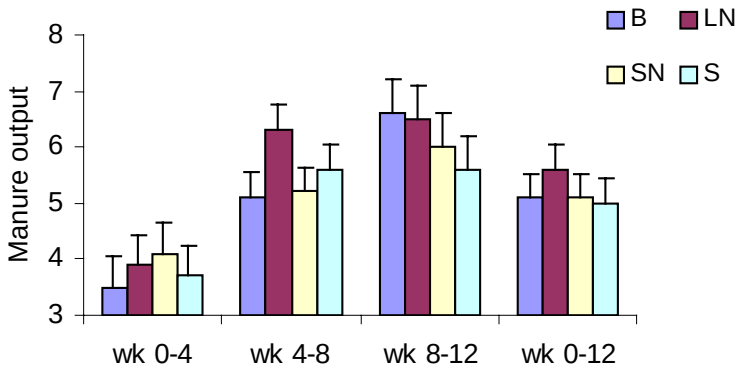
Effect of drinker management on ADG (g/d)

Item	Bowl	L-N	S-N	Step	SE	*P*
wk 0-4	732	693	721	735	32.0	0.78
wk 4-8	990	1010	974	902	60.1	0.61
wk 8-12	876	950	849	930	54.7	0.55
wk 0-12	866	885	848	855	19.5	0.59

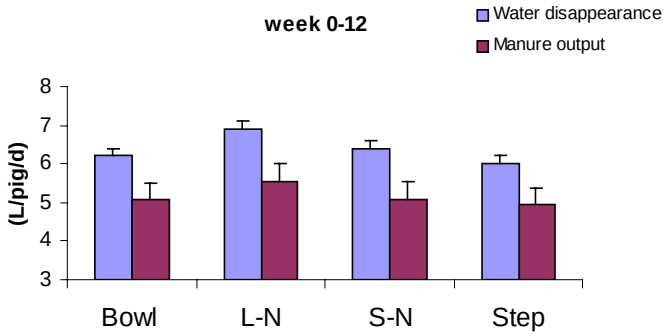
Effect of drinker management on water disappearance (L/pig/d)



Effect of drinker management on manure output (L/pig/d)



Water disappearance and manure output (L/pig/d)



Conclusions

- Grower/finisher pigs wasted 25% of water from well managed nipple drinker.
- High flow rate and low nipple height increased water wastage.
- Water disappearance (13%) and manure output (11%) were reduced by using the stepped nipple drinker

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