

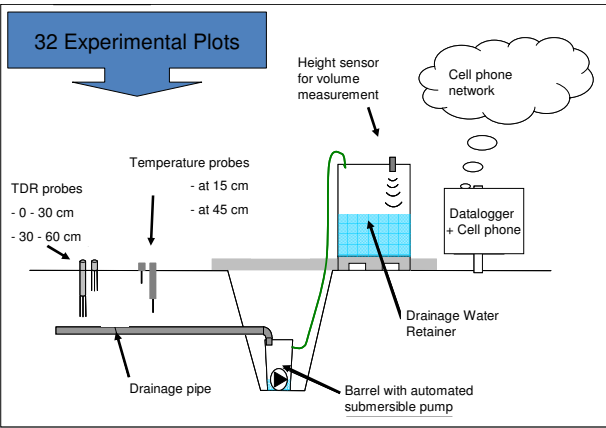


Yield response of Cauliflower to different 'just-in-time' fertilization treatments in an online-monitored approach

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1. Introduction

- Horticultural crop farming in Flanders, Belgium is prone to overuse of fertilizer
→ Harmful to environment (i.e. sequestration) and mayor production cost factor
- Study's objective : control amount of Nitrogen fertilizer in a very precise manner
→ without production or quality loss
- Real time follow-up of all fertilization and irrigation inputs and outputs



2. Experimental Site Set-up :

Cauliflower March – June 2009

- Impenetrable foil at depth of 90 cm on 32 plots → drainage water retained
 - 4 Nitrogen Application Rates
 - 4 Application Strategies
- **4x4 completely randomized factorial design**
replicated over 2 blocks

Nitrogen Dose	N Target Value at Plantdate (kg/ha)	Fertilization 6 Mar '09 (Kg N/ha)	N Target Value 7 weeks later (kg/ha)	Fertilization 27 Apr '09 (Kg N/ha)	Treat-ment	Fertilizer	Application Strategy
1	50	30	100	43	1	Calcium Ammonium Nitrate	Fertigation (2-weekly)
2	100	80	150	35	2	Amm. Sulphate Nitrate + inhibitor	Band
3	150	130	200	25	3	Amm. Sulphate Nitrate	Band
4	200	180	250	18	4	CAN	Broadcast

3. Results Plant Sampling :

- 10 plants/ plot sampled every 2 weeks → Fresh & Dry Weight, N-content
- Multifactorial ANOVA at harvest on Curd Fresh Weight ⁽¹⁾
→ **3rd & 4th Dose significant higher output in FW, DW and Quality**
- Multifactorial ANOVA during growth on Leaf N-content ⁽²⁾



Effect	F Value	Pr > F
Treatment	1.76	0.1548
Dose	8.32	<.0001
Treat*Dose	2.28	0.0182
Block	46.38	<.0001

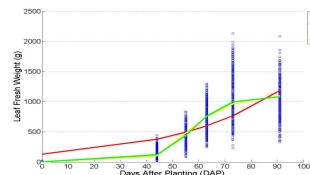
	Fresh Weight (g) at harvest		% Flandria
	Plant	Curd	
Dose 1	2035	1334	69
Dose 2	2344	1484	63
Dose 3	2624	1620	73
Dose 4	2597	1609	76

Effect	F Value	Pr > F	Effect	F Value	Pr > F
Treatment	0.21	0.8875	DAP	65.27	<.0001
Dose	29.11	<.0001	Treatment*DAP	0.95	0.4942
Treatment*Dose	0.81	0.6122	Dose*DAP	2.61	0.0190
Block	0.23	0.6312	Treatment*Dose*DAP	0.57	0.9318

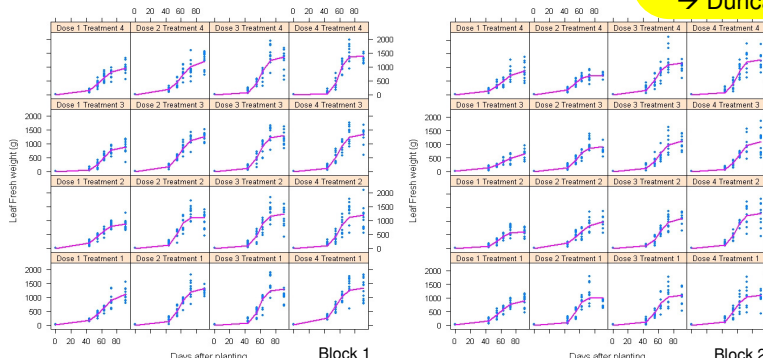
4. Growth Curve Fitting :

- Exponential, Logistic and Gompertz fit on Leaf Fresh Weight
→ Logistic best fit $R^2 = 0.891$ [$LFW = (LFW_0 * LFW_f) / (LFW_0 + (LFW_f - LFW_0) * \exp(-\mu * DAP))$]
- Gompertz nearly equal [$LFW = a * \exp(-b * \exp(-k * DAP))$]
- Growth curves calculated per Block, per Dose and per Treatment
- ANOVA on resulting parameters
→ **growth curves significantly different between scenarios** ~ primarily LFWf
→ Duncan significantly different groups ~ primarily on dose

Fitting Growth Curve on Cauliflower Leaf Fresh Weight LFW vs. DAP



Dep. Variable	F Value	Pr > F	R ²
LFWf	7.63	0.0001	0.891
LFW0	0.94	0.5461	0.502
mu	1.98	0.0963	0.679



Block	m(LFWf)	1	2	3	4
	m(LFWf)	1207.4	1008.9		
	m(mu)	0.5375	0.8932		
Dose	m(LFWf)	890.42	1073.4	1210.7	1258.0
	m(LFW0)	1.9771	0.6559	0.0922	0.1362
	m(mu)	0.1170	0.1497	0.1695	0.1761
Treat.	m(LFWf)	1156.5	1054.3	1088.1	1156.5
	m(LFW0)	0.5971	0.5192	1.0599	0.6853
	m(mu)	0.1563	0.1576	0.1429	0.1551

