Cattle and Pasture Responses to Poultry Litter and Tall Fescue - Endophyte Association in the Southern Piedmont USA



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- Nutrients derived from poultry litter will affect forage and cattle productivity different from nutrients derived inorganically, because of:
- altered seasonal and total availability of macro- and micro-nutrients
- forage
- Novel endophyte will improve cattle performance and productivity compared with wild-type
- Novel endophyte will improve tall fescue persistence compared with endophyte-free grass



Experimental Design

- 14, 1-ha paddocks of 'Jesup' tall fescue ready for grazing in April 2002 All with water flume to collect water runoff
- Total of 7 treatments, each replicated twice Six treatments grazed by yearling heifers
- **Fertilization Source** Inorganic **Broiler litter**
- One treatment cut for hay (inorganic, novel)
- Determine the effects of fertilization source and tall fescue – endophyte association on:
- Botanical composition Tall fescue persistence
- Cattle stocking rate
- Cattle performance
- Cattle production

Hypotheses

interactions with endophyte-induced metabolites of



X Endophyte Association Endophyte free Novel endophyte Wild-type endophyte

Objective



Forage Mass



Botanical Composition

Tall fescue composition of pasture (% ground cover) 2002 to 2006

Year	Free		Novel		Wild
May 2002	50	>	34	<	59
July 2003	73		83		88
July 2004	70		69	<	77
June 2005	90	>	82	<	93
June 2006	73		79		83
5-yr mean	71		69	<	80

Results

Effect of Fertilization Source

Response	Inorgan	ic	Broiler Litter
Forage mass (Mg/ha)	1.54	ns	1.50
Stocking rate (head/ha)	2.5	ns	2.4
Stocking weight (Mg/ha)	1.05	ns	1.01
Average daily gain (kg/head/day)	0.69	ns	0.67
Total gain (kg/ha/yr)	601	ns	571

No significant interactions between fertilization source and tall fescue-endophyte association with any response variable when averaged across 5 years.



Botanical Composition

Percent of ground without cover (bare)

2002 to 2006

Year	Free		Novel		Wild
May 2002	25		33		23
July 2003	4		5		3
July 2004	17	<	25		21
June 2005	8	<	15	>	7
June 2006	26	>	19		17
5-yr mean	16	<	19	>	14

5-yr mean

Cattle Performance

Α	verage	daily	gain	of	heifers	on	pasture
	2002 to	o 200	6				

eriod												Free	Novel		Wild
Vinter .												0.55	0.63	>	0.46
pring	•						•					0.96	0.96	>	0.62
ummer											-	0.63	0.60		0.55
utumn	•	•	•	•	•	•	•	•	•	•	•	0.63	0.70	>	0.44
early												0.74	0.76	>	0.53
. 1993	-	bo s		-	-		6		10	5.15	1	(PA)	in the	la.d	Praise
E succession						120	-		N IN				Start and		
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Cattle Production

Total gain of heifers on pasture (kg/ha) 2002 to 2006

Period						Free
Winter .						47
Spring						293
Spring Summer						107
						151
Yearly						598



Cattle Stocking Weight

Mean weight of heifers stocked on pasture (Mg/ha) 2002 to 2006

Period												Free	Novel		Wild
Winter .												0.76	0.75		0.86
Spring											-	1.05	1.05	<	1.37
Summer												1.11	1.08	<	1.33
Autumn	•	•	•	•	•	•	•	•	•	•	-	0.80	0.81	<	0.94
Yearly												0.96	0.95	<	1.18



Cattle Production

Cumulative gain of heifer crop on pasture (kg/ha) 2002 to 2006



e (kg/head/day)



Summary and Conclusions

- Fertilization source had no impact on how forage and cattle responded to tall fescue-endophyte association.
- Typical wild endophyte effect on cattle performance was observed, but not necessarily in the heat of summer when a large effect was expected.
- Novel endophyte association produced excellent cattle gain.
- Persistence of novel endophyte was reasonable during the first 5 years, but a trend was for greater similarity with enodphyte free than with wild endophyte association.
- Pastures were stocked with more cattle with wild endophyte to achieve a common forage mass level among treatments, resulting in similar total cattle live-weight gain.
- Opportunities to manage wild endophyte are possible (e.g., manipulating fertilizer quantity and timing and season of grazing), so that negative effects of ergot alkaloids can be avoided.

