



# Relations between seed yield and plant nitrogen contents in three Festuca species

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## Introduction:

Although seed yield is a complex trait affected by agricultural practices as well as environmental factors, traits related to seed production reveal considerable genetic variation, prerequisite for improvement by direct or indirect selection. Numerous research documented primary, secondary etc. traits with its quantified relation to seed yield in most of grass species significant for agricultural practice. Application of nitrogen in early spring stimulates the development of reproductive tillers, but excess nitrogen can lead to severe lodging, reduced seed set, and increased secondary tillering. The nitrogen application strategy, i.e., rate and distribution between autumn and spring is a very important management tool to stimulate seed crop development. However, recent environmental concern has brought restrictions to the amount of nitrogen that farmers are allowed to use in some seed production areas. Therefore, it is important to search for existing genetic variation of nitrogen contents in plants with its relation to seed yield. **The aim of our research was to investigate factors affecting seed yield of three Festuca species with special attention paid on relations with N-contents in plants.**

## Materials & methods:

Field experiment has been set-up in 2014 in four locations in Poland: Radzików, Szelejewo, Leszno and Nieznanice. Fifteen genotypes, 5 per species of tall fescue (*Festuca arundinacea* Schreb.), meadow fescue (*Festuca pratensis* Huds.) and red fescue (*Festuca rubra* L.) were tested during two years for 18 traits directly and indirectly related with seed yield. STATISTICA ver.12 [StatSoft, Inc. (2014)] software was used for calculations and analysis.

## Results:

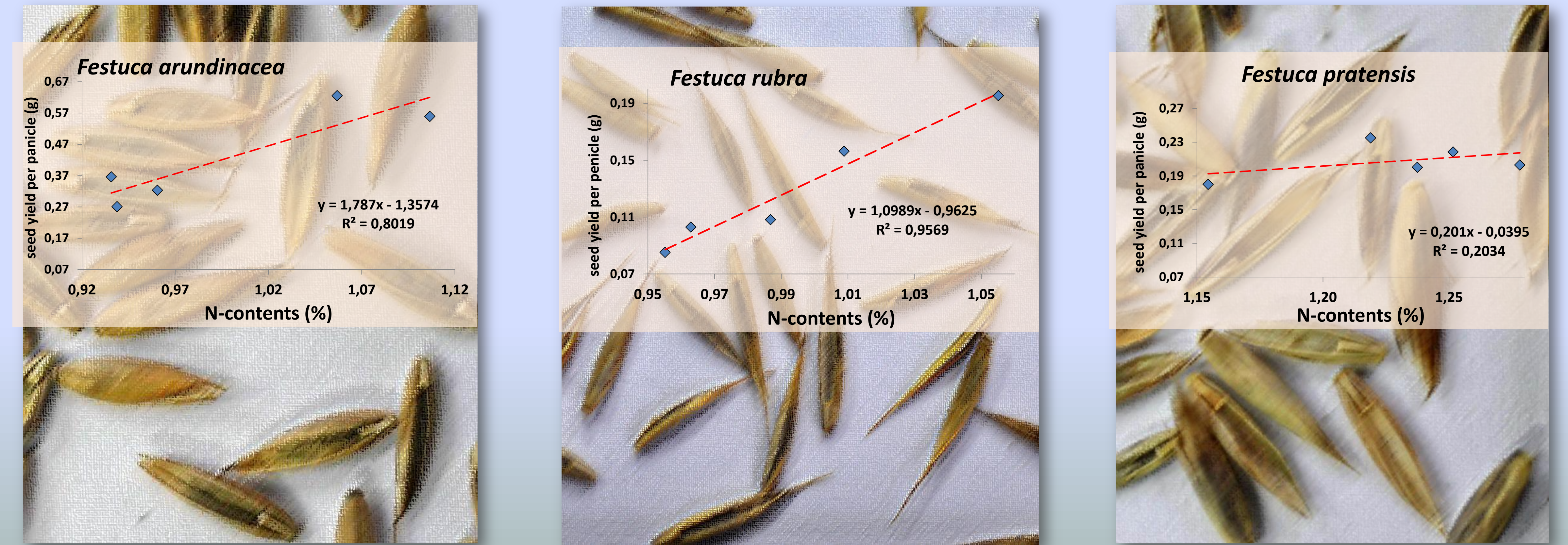
Seed yield has been measured at three different levels: panicle, plant and plot yield. *Panicle yield* has been determined by leaf area, length of inflorescence as well as nitrogen contents in the whole plants. For *seed yield from the whole plant* not such relations were found. In case of red fescue it was related to plant condition after winter and plant habit. As far as we move from single panicle to larger number of seed-producing plant parts (whole plant – plot), number of traits significantly related to yield decrease. It is due to the fact that number of factors influencing seed yield increases.

Pearson’s correlation coefficients with significant values marked by \* and yellow highlighted

<i>Festuca</i> :	Seed yield from:	WG	OW	PH	HEAD	FLOW	BIOM	SHAT	P_H	L_L	L_W	L_A	N_GEN	INFL_LEN	CCI	N%
<i>arundinacea</i>	panicle	0,05	-0,13	0,30	0,56	0,18	0,63	0,66	0,83	0,88	0,99 ***	0,98 **	- 0,92 **	0,97 **	0,91 **	0,90 **
<i>pratensis</i>		-0,39	-0,75	0,66	-0,27	-0,27	-0,56	-0,73	0,69	0,68	0,76	0,73	-0,80	0,91 **	0,51	0,45
<i>rubra</i>		0,14	0,55	0,17	-0,68	0,87	-0,23	0,66	0,78	0,89 **	0,82	0,89 **	-0,78	0,96 **	0,35	0,98 ***
<i>arundinacea</i>	plant	-0,47	-0,13	-0,80	0,33	0,72	-0,53	-0,30	-0,74	-0,66	-0,45	-0,54	0,65	-0,53	-0,63	-0,59
<i>pratensis</i>		0,84	0,85	-0,67	0,37	0,27	0,82	0,05	-0,81	-0,84	-0,87	-0,87	0,75	-0,64	-0,86	- 0,90 **
<i>rubra</i>		0,70	0,94 **	0,92 **	-0,73	-0,02	0,86	-0,23	0,61	0,60	0,67	0,60	0,27	0,51	-0,26	0,31
<i>arundinacea</i>	plot	-0,55	-0,22	-0,85	0,23	0,65	-0,70	-0,50	- 0,88 **	-0,82	-0,62	-0,70	0,81	-0,68	-0,74	-0,68
<i>pratensis</i>		0,71	0,70	-0,65	0,55	0,37	0,68	-0,17	-0,61	-0,63	-0,68	-0,66	0,53	-0,38	-0,72	-0,77
<i>rubra</i>		0,71	0,96 **	0,85	-0,84	0,13	0,74	-0,09	0,743	0,73	0,76	0,73	0,08	0,67	-0,17	0,48

Trait codes explanation: WG – winter greens, OW – overwintering, PH – plant habit, HEAD - heading date, FLOW – flowering date, BIOM – plant biomass yield, SHAT – seed shattering, P\_H – plant height, L\_L – leaf length, L\_W – leaf width, L\_A – leaf area, N\_GEN – number of generative stems, INFL\_LEN – panicle length, CCI – chlorophyll contents index, N% - nitrogen content in plants (%).

Nitrogen contents in plants was differently related to seed yield. For *F.arundinacea* and *F. rubra* it was positively related with panicle seed yield, but not for *F. pratensis*. Probably, higher N contents (>1,20%) resulted in higher seed shattering ( $r = 0,46$  \*\*).



**Conclusions:** Nitrogen contents in plants can be a valuable indicator of potential seed yield of *Festuca* species. However, caution should be made due to observed differences between species.