The Impact of Sowing Type on some Productivity Elements in *Festuca rubra* L. Seed Production (II): Amount of Seeds per Plant

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Abstract
The amount of seeds per plant is one of the three features (besides density and seeds weight) conditioning seed production in agricultural crops. In its turn, density is influenced by the sowing distance between the rows and by the seeding rate. Using a lower seeding rate (5 kg/ha) has a stronger impact on the amount of seeds per plant in bird's-foot trefoil compared to a larger rate (20 kg/ha). The analysis of the impact of trial factors on the amount of seeds per plant in *Festuca rubra* L. shows that the variants sowed at sowing distances of 12.5 cm or 25 cm at a rate of 5 kg/ha ensure the highest increase of the amount of seeds per plant.

Keywords: amount of seeds per plant, *Festuca rubra* L., seeding rate, sowing distance

1. Introduction

Sowing distance and seeding rate are important factors in improving production technology in grassland perennial grasses [1, 2].
The paper points out the way in which sowing distance and seeding rate influence some productivity elements in seed production in *Festuca rubra* L. The ability of bird's-foot trefoil of producing generative shoots was presented in the first part of our paper (published in 2011); in this second part, we present the impact of sowing type on seed yield per plant.

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2. Materials and methods

The researches were performed at the Research-Development Station for Pastures Timişoara, on a brown vertic eumesobasic soil, moderately gleyied, alkaline in the depth (low below 100 cm), moderately decarbonised, strongly clogged up by water, on medium fine/medium fluviatile deposits, medium loam/medium clayey loam, during 2004-2007.
The experimental display of our researches comprised a bifactorial experience, with the following graduations: A – Distances between rows a_1 = 12.5 cm; a_2 = 25 cm; a_3 = 50 cm; B – Planting norms b_1 = 5 kg/ha; b_2 = 10 kg/ha; b_3 = 15 kg/ha; b_4 = 20 kg/ha.
The experience was arranged in field according to the sub-divided parcel method, in four replications, with parcel's area of 20 m^2.
During the first year of vegetation, we carried out two maintenance cuttings, to remove the weed

species, without yield determination. In the case of the variants planted with the distance of 50 cm between rows, we applied two mechanical hoeings with the help of the motocultivator.
The fertilization was applied every year, at the end of the spring, with a quantity of 250 kg/ha complex fertilizers (15:15:15).
The biological material used for planting was represented by the *Festuca rubra* variety Pastoral.

3. Results and discussion

The amount of seeds per plant is one of the very important quantitative elements in increasing seed production, including perennial grass species.
Analysing variance in this feature shows that the two trial factors studied (seeding distance and seeding rate) have a great impact on the amount of seeds per plant: thus, there are statistically ensured differences between the graduations of the factors (Table 1).
A seeding distance of 25 cm ensures a distinctly significant increase of the amount of seed per plant of 27% on the average compared to the variant whose seeding distance was 12.5 cm (Table 2, Figure 1).
Optimal seeding distance in *Festuca rubra* L. is conditioned by the use of a small amount of seeds compared to a fodder crop, for instance.
Data presented in Table 3 and Figure 2 show that compared to the variant sowed at a seeding rate of 20 kg/ha, the variant sowed at a seeding rate of 5 kg/ha yielded a very significant increase of the amount of seeds per plant, i.e. about 2.5 times more.
If we analyse the impact of the interaction of trial factors on the amount of seed per plant in *Festuca rubra* L. (Table 4, Figure 3) we can draw the following conclusions:
- A seeding distance of 12.5 or 25 cm and a seeding rate of 5 kg/ha ensure the highest increase of the amount of seeds per plant;
- If we choose larger seeding distances (50 cm), the seeding rate is still 5 kg/ha, but we need to do some maintenance work on the intervals between the rows.

Table 1. Impact of seeding rate and of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

VARIANCE ANALYSIS

SOURCE	SUM SQUARES	VARIANCE LIBERTY	DEGREE S^2	TEST F Value	Significance
Total trial	96.961	35			
Large plots Total	11.03955	8			
Blocks	2.40879	2			
A	7.65822	2	3.829112	15.74901	*
Error a	0.97253	4	0.243133		
Medium plots Total	85.92151	27			
B	76.53349	3	25.51116	711.4235	***
AB	8.74255	6	1.457091	40.63354	***
Error b	0.64547	18	0.035859		

* * * Table of limit differences * * *

Source of variation	Test t			Test Tukey	
	DL 5%	DL 1%	DL 0.1%	DL 5%	D L 1%
a	0.5590416	0.9264102	1.7247	0.5181233	0.811347
B	0.1875905	0.2570004	0.350106	0.1874719	0.256906
ab	0.2899546	0.4596125	0.805899	0.2740091	0.414866
# ab|a – constant	0.1624582	0.2225688	0.303201	0.1623555	0.222487

Variation coefficient: 4.19%

Table 2. Impact of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

Seeding distance (cm)	Amount of seeds (g/plant)	Difference	%	Significance
12.5	4.06	control	100	
25	5.15	1.09	127	**
50	4.34	0.28	107	

DL 5% = 0.56 g/plant; DL 1% = 0.93 g/plant; DL 0.1% = 1.72 g/plant

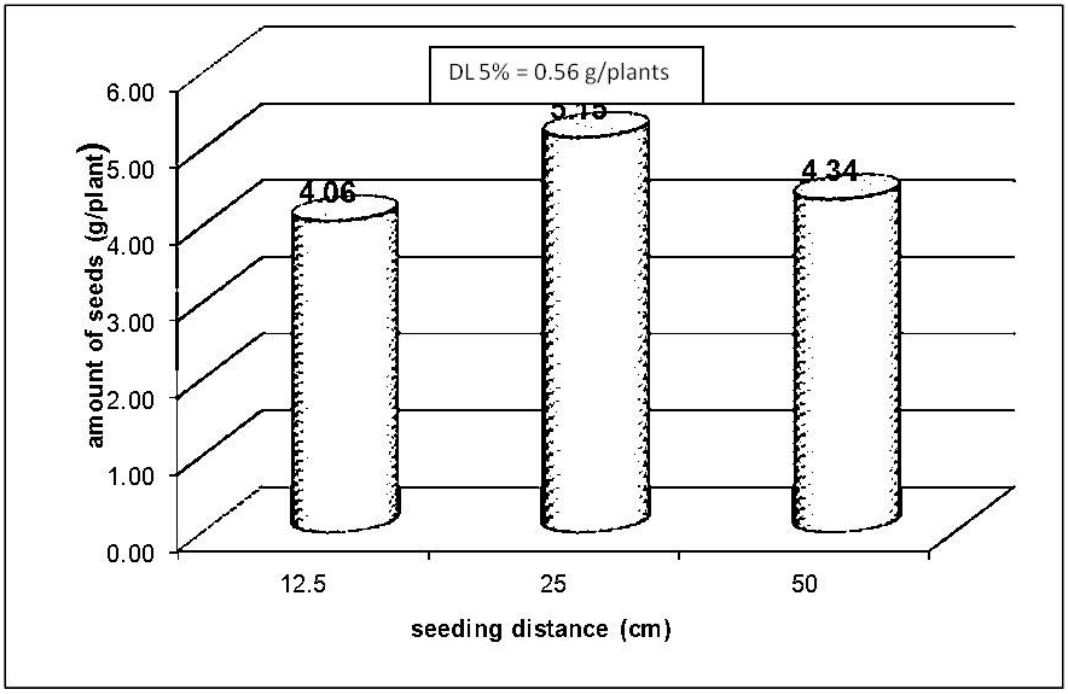

Figure 1. Impact of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

Table 3. Impact of seeding rate and of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

Seeding rate (kg/ha)	Amount of seeds (g/plant)	Difference	%	Significance
5	6.49	3.91	252	***
10	5.16	2.57	200	***
15	3.84	1.26	149	***
20	2.58	control	100	

DL 5% = 0.19 g/plants; DL 1% = 0.26 g/plant; DL 0.1% = 0.35 g/plant

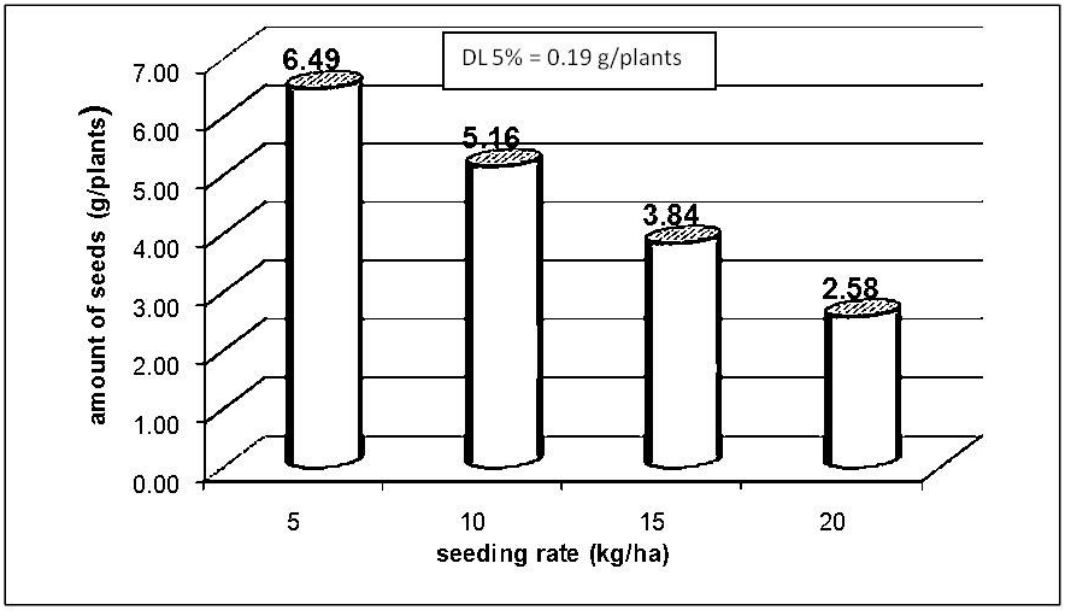

Figure 2. Impact of seeding rate on seed amount in *Festuca rubra* L. (g/plant), multiyear average

Table 4. Impact of seeding rate and of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

Seeding distance (cm)	Seeding rate (kg/ha)	Amount of seeds (g/plant)	Difference	%	Significance
12.5	5	7.00	5.52	473	***
	10	4.79	3.31	324	***
	15	2.97	1.49	201	***
	20	1.48	control	100	
25	5	6.99	5.51	472	***
	10	5.88	4.40	397	***
	15	4.58	3.10	309	***
	20	3.14	1.67	212	***
50	5	5.48	4.00	370	***
	10	4.80	3.32	324	***
	15	3.97	2.49	268	***
	20	3.12	1.64	211	***

DL 5% = 0.29 g/plants; DL 1% = 0.46 g/plants; DL 0.1% = 0.80 g/plants

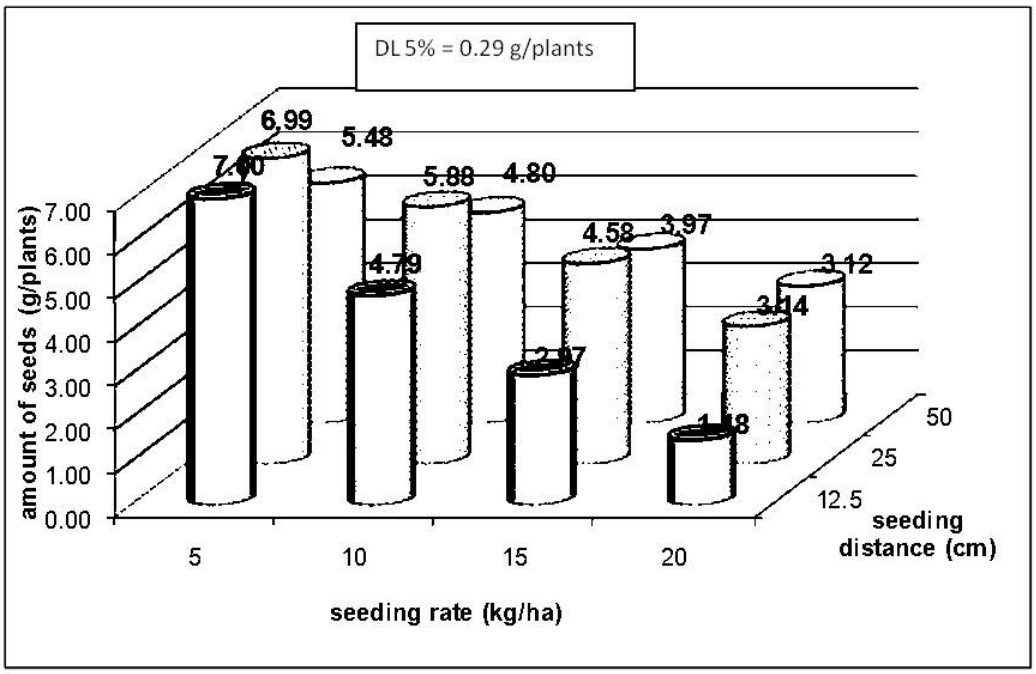

Figure 3. Impact of seeding rate and of seeding distance on seed amount in *Festuca rubra* L. (g/plant), multiyear average

4. Conclusions

Analysing the results of our research on the impact of the interaction between seeding distance and seeding rate on some productivity elements in *Festuca rubra* L. allowed us to point out the following:

- A seeding rate of 5 kg/ha has a strong impact on the shooting ability of bird's-foot trefoil compared to a higher rate. On the average, in this seeding rate, there was a very significant increase (19%) of the number of generative shoots compared to the variant sowed at a seeding rate of 20 kg/ha. There were close results in the variant sowed at a seeding rate of 10 kg/ha (an increase in yield of 12%).
- Mean results show that the largest number of generative shoots results when the seeding rate is low (5 kg/ha), no matter the seeding distance. Thus, the largest number of generative shoots per

- m^2 (2,064) was in the variant sowed at a seeding distance of 25 cm with a seeding rate of 5 kg/ha.
- The analysis of trial factors on the amount of seed per plant in *Festuca rubra* L. points out the variants sowed at a seeding distance of 12.5 or 25 cm, with a seeding rate of 5 kg/ha, that ensure the highest increase of the amount of seeds per plant.

References

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