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Impact of Row Spacing and Seed Rate on the *Lolium perenne L.* Production Characteristics

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Introduction

Perennial ryegrass (*Lolium perenne* L.), from an agronomic point of view, represent the most important grassland type for pasture in temperate climates and it is the most important type in the genus Lolium [1]. It is a native plant type in Europe from where is widespread to North America, Africa and Australia. In Serbia, it is known as one of the best forage species [2], characterized by high nutritional value and therefore can be used for grazing as well as for hay or silage. It is reported that Perennial ryegrass has been cultivated as a forage species since the 17th century [3]. Additionally, Perennial ryegrass shows a high degree of genetic variation in the population [4], which is very important considering diploid varieties are still the majority of seed sown [5] in the world.

Material and Methods

In this paper are shown the results of the production characteristics of the *Lolium perenne* L. cv. Naki, which grown in rows with different row spacing and seed rate in the agro ecological conditions of central Serbia in the period 2012-2014. Four levels of two observed factors were used in the experiment: row spacing (12.5; 25; 37.5 and 50 cm) and seed rate (9, 16, 23 and 30 kg ha^{-1}). The observed factors were combined with each other and it was measured the impact of the factors on the production characteristics of Perennial ryegrass.

Results and Discusion

In the last decade, research on grassland populations has focused on quantified production per unit area. Some plants have been observed as a minimal physiological unit in grassland components (Simić *et al.*, 2009; Janković *et al.*, 2018). The tillers are the basic unit of production and durability of the lawn (Matthev *et al.*, 2011), so that to further improvement of production, the characteristics of the tillers are important for some species. The highest and smallest height of tillers were recorded in 2013 (74.7 cm) and in 2014 (63.5 cm), respectively. Due to very wet conditions in 2014 (rainfall in the vegetative period was 710.9 mm and in 2013 it was 332.5 mm), these two years were climatic extremes for the height of the tillers.

At the harvest, as an indicator of seed production efficiency, were influenced by all treatments applied. The highest harvest index was recorded in 2013 (40.2%), which was an unexpected result. As follows, a very significant correlation was notices between the height of the tiller and seed rate (r = 0.839), the height of the tiller and harvesting tiller (r = 0.721). The length of the spike and number of spikelets per spike have lower impact on seed yield and dry weight. Harvest index negatively affected correlation of dry weight in all three years, while the seeding rate on yield increased.

Table 3. Statistical summary of changes in tiller and harvest characteristics according to stand density (LSD test)

Parameter	2012	2013	2014
		Tiller length	
Inter-row spacing A	**	**	**
Seeding rate B	**	**	**
AxB	ns	ns	ns
		Spike length	
Inter-row spacing A	**	**	**
Seeding rate B	**	**	**
AxB	ns	**	ns
		Spikelets per spike	
Inter-row spacing A	**	**	**
Seeding rate B	**	**	**
AxB	ns	ns	ns
		Seed yield	
Inter-row spacing A	**	**	**
Seeding rate B	**	**	**
AxB	ns	ns	ns
		Shoot DM	
Inter-row spacing A	**	**	**
Seeding rate B	**	**	**
AxB	*	ns	ns
		Harvest index	
Inter-row spacing A	**	**	**
Seeding rate B	ns	**	**
AxB	ns	**	**

Conclusion

Due to the analyses the height of the tiller, the length of the spike and the number of spikelets per spike gave better results by sowing in wider rows (37.5 and 50 cm) using lower seed rate (9 and 16 kg ha^{-1}). Seed yield and harvest index responded favourably to sowing in rows at a wider row spacing (37.5 and 50 cm) in combination with a lower seed rate (9 and 16 kg ha^{-1}), while shoot dry weight gave better results by sowing in narrower rows (12.5 cm) with lower seed rate (9 and 16 kg ha^{-1}). Using the appropriate row spacing in sowing and the optimum of seed rate provides the highest results of the production characteristics of the Perennial ryegrass that can be applied to further production.

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