

Comparison of Liquid and Solid Digestate Fractions as Replacements for Synthetic Nitrogen Fertilizers in Maize Production in Croatia

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INTRODUCTION

Biogas is a renewable source of energy obtained from anaerobic digestion [1]. This process also produces large amounts of post-digestion matter, called digestate, that is rarely used as a fertilizer in Eastern Europe due to the lack of knowledge. The digestate can be separated into solid and liquid fractions, which may be suitable for land application [2-5].

AIM

This study explores how different digestate fractions affect maize (*Zea mays* L.) production once applied as a nutrient source in substitution of synthetic nitrogen fertilizers in Croatia.

MATERIALS AND METHODS

Experimental design

Eight different treatments were applied on a silt loam soil in Maksimir, Zagreb experimental field. All treatments had four repetitions: control (1), mineral fertilizer NPK (2), liquid cattle manure (3), solid fraction SF of digestate (4), liquid fraction LF of digestate (5), a mix of solid and liquid fraction of digestate (6), a mix of NPK and SF (7) and a mix of NPK with LF (8). 140 kg N/ha was applied to each treatment. As a test crop, maize was sown on April 27 and harvested on September 28, 2018.



RESULTS

Results showed that NPK and the combination of NPK with LF resulted in higher yield as compare to other treatments (Figure 1.).

Table 1. Soil characteristics before fertilization

Depth cm	pH		Humus %	N _{min} kg/ha of soil	P ₂ O ₅ mg/100 g of soil	K ₂ O mg/100 g of soil
	H ₂ O	KCl				
0-30	5,3-5,6	4,1-4,4	1,6-1,7	37,7-40,0	15,2-18,3	20,0-24,0

Table 2. Characteristics of organic fertilizers

	pH H ₂ O	(%) N FW	(%) P ₂ O ₅ FW	(%) K ₂ O FW
Liquid cattle manure	6,6	0,4	0,2	0,3
Solid fraction of digestate	8,7	1,3	0,3	0,3
Liquid fraction of digestate	7,7	0,8	0,1	0,4

FW: fresh weight

CONCLUSION

The mixture of digestate with NPK resulted in grain yield similar to the treatment with the synthetic NPK fertilizer. This shows that digestate has a similar effect on maize production and yield as this might lead to cost reduction of used synthetic fertilizer on arable land. This experiment will be performed in the following year.

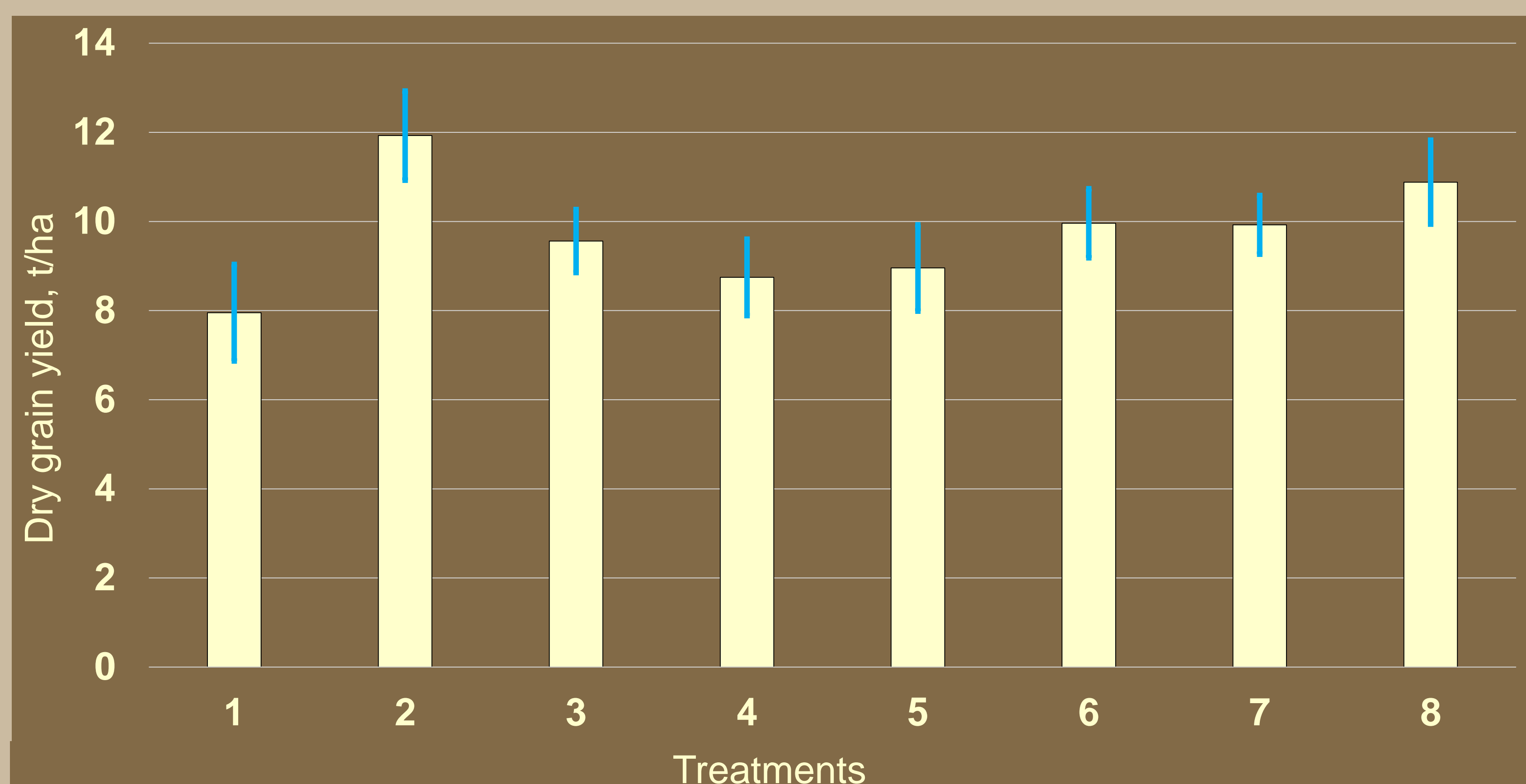


Figure 1. Dry grain yield per ha (14% moisture) on different treatments: control (1), mineral fertilizer NPK (2), liquid cattle manure (3), SF of digestate (4), LF of digestate (5), a mix of SF and LF of digestate (6), a mix of NPK and SF (7) and a mix of NPK with LF (8)

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