



**INTRODUCTION.** The litter decomposition is one of the largest fluxes in the global terrestrial carbon cycle, thus diverse extensive experiments have been focusing on this fundamental soil process. Our study has been conducted as a part of the large-scale decomposition experiment within the global collaborative network *TeaComposition initiative*. The aim of this initiative was to estimate short- to long-term plant litter decomposition rates by using standard protocols and substrates—commercially available Green tea and Rooibos tea with different decomposition rates—for comparison of the litter mass loss at numerous sites across various ecosystems worldwide. The objective of our study was to test the effects of both litter type and land-use on litter decomposition in three, 12, 24 and 36 months of incubation (year 2016 to 2019), by comparing the percentages of the tea mass lost.

**METHOD & DESIGN.** The TeaComposition method (modified Tea bag method by Keuskamp et al. 2013) involves measuring a tea bag before and after incubation in the field, and using mass loss as a measure of the organic material decomposed. The three localities chosen for our experiment corresponded to the three levels of protection regime established for the National park Fruška gora, with different management treatments. The 1<sup>st</sup> sub-site is within the highest level of protection—the least degraded and non-managed forest; 2<sup>nd</sup> and 3<sup>rd</sup> sub-sites are under 2<sup>nd</sup> and 3<sup>rd</sup> level of protection, both characterized by controlled wood exploitation. The guidelines of the standardized protocol of the *TeaComposition initiative* (Djukic et al. 2018) were followed throughout. Two homogenous plots were selected at each of the three sub-sites; two replicates of the two tea types were buried in the topsoil layer in each plot, resulting in four bags of each tea type per sub-site and sampling time (Figure 1).



Figure 1. The 1<sup>st</sup> sub-site of the site Fruška gora (A); tea bags installation plot within the 2<sup>nd</sup> sub-site (B).

Table 1. Tea mass loss in four periods of incubation

Tea type	Plot / treatment	Initial weight [g]*	Weight after 3 months [g]**	Mass loss in 3 months [%]	Weight after 12 months [g]**	Mass loss in 12 months [%]	Weight after 24 months [g]**	Mass loss in 24 months [%]	Weight after 36 months [g]**	Mass loss in 36 months [%]
Green	I / no intervention	1.802	0.477	74	0.481	73	0.391	78	0.467	74
Green	II / selective cutting	1.782	0.480	73	0.452	75	0.754	58	0.877	50
Green	III / selective cutting	1.816	0.531	70	0.353	81	0.374	79	0.441	75
Rooibos	I / no intervention	1.927	1.268	34	1.016	47	0.912	53	1.086	44
Rooibos	II / selective cutting	1.926	1.292	32	1.040	46	1.109	43	1.264	34
Rooibos	III / selective cutting	1.940	1.520	21	1.294	33	0.968	50	1.296	34

**RESULTS.** The values of the tea mass lost during all four incubation periods were higher for the Green tea than for the Rooibos tea (Table 1). This pattern was expected because of the faster decomposition rate of Green tea due to higher content of non-lignified cellulose and of water-soluble compounds (Keuskamp et al. 2013). Furthermore, the difference of the two tea types' mass loss was the highest in three-months incubation. Our study has also shown no clear pattern regarding the values variation of the tea mass loss among plots of three different sub-sites. However, the highest level of variation was found for the Green tea in the longer incubation periods (24 and 36 months).

\*Average weight (without bag, string and tag) of all tea bags per plot before incubation

\*\*Average weight (without bag, string and tag) of tea bags per plot retrieved after 3/12/24/36 months incubation

• Djukic I et al. 2018. Early stage litter decomposition across biomes. *Science of the Total Environment* 628-629:1369-1394.

• Keuskamp J et al. 2013. Tea Bag Index: a novel approach to collect uniform decomposition data across ecosystems. *Methods in Ecology and Evolution* 4:1070-1075.

• Kwon T et al. 2021. Effects of climate and atmospheric nitrogen deposition on early to mid-term stage litter decomposition across biomes. *Frontiers in Forests and Global Change* 4:678480.

**CONCLUSIONS.** Our results are in accordance with previous research (e.g. Djukic et al. 2018; Kwon et al. 2021) showing that, in the early stage of litter decomposition, the litter quality had the strongest influence on mass loss, whereas there was no significant effect of land-use or management practices. The microbial decomposition is carried out by many groups of microorganisms and is not limited by nutrients during the growing season. Still, differences in the litter mass loss among the land-use types increase in the later phases—as decomposition progresses—because of the decomposer groups being more selected, i.e., fewer microbes possess the degradation enzymes for the remaining organic compounds. This pattern is more clear in Green tea, because Rooibos tea has much slower litter decomposition rate, due to high lignin content.

These conclusions suggest that potential shifts in the relative abundance of vegetation types in the future caused by climatic changes could have large effects on global carbon budgets alone due to the differences in litter quality and consequently decomposition rates.



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BOOK OF ABSTRACTS



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### CONCLUSIONS:

The obtained results indicate that proline and sugar/sugar alcohol based deep eutectic solvents are good extracting agents for phenolic compounds, especially for higher caffeic acid oligomers such as clinopodic acid O. Additionally, low cytotoxicity of tested DESs is a good starting predictor of their safety and potential usage.

## T1-P-7 Assessment of litter decomposition in temperate deciduous forest: A case study in Fruška Gora, Serbia

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**KEYWORDS:** TeaComposition initiative; litter decomposition; litter quality

### INTRODUCTION:

Our study has been conducted as a part of the large scale decomposition experiment within the global collaborative network "TeaComposition initiative". The aim of this initiative was to estimate short- to long-term plant litter decomposition rates by using standard protocols and substrates—commercially available Green tea and Rooibos tea with different decomposition rates—for comparison of the litter mass loss at numerous sites across various ecosystems worldwide.

### OBJECTIVES:

The aim of our study was to test the effects of both litter type and land-use on litter decomposition in 3, 12, 24 and 36 months of incubation, by comparing the percentages of the tea mass lost.

### METHOD / DESIGN:

The TeaComposition method (modified Tea bag method) involves measuring a tea bag before and after incubation in the field, and using the difference in weight as a measure of the organic material decomposed. The three localities chosen for our experiment corresponded to the three levels of protection regime established for the National park Fruška gora, with different management and treatments within the temperate deciduous forest. The guidelines of the standardized protocol of the "TeaComposition initiative" were followed throughout. Two homogenous plots were selected at each of the three sub-sites; two replicates of the two tea types were buried in the topsoil layer in each of the two blocks, resulting in four bags of each tea type per sub-site and sampling time.

### RESULTS:

The values of the tea mass lost during all four incubation periods were higher for the Green tea than for the Rooibos tea. This pattern was expected because of the faster decomposition rate of Green tea due to higher content of non-lignified cellulose and of water-soluble compounds. Furthermore, the difference of the two tea types' mass loss was the highest in three-months incubation. Our study has also shown no clear pattern regarding the values variation of the tea mass loss among three different plots; however, the highest level of variation was found for the Green tea in the longer incubation periods (24 and 36 months).

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### CONCLUSIONS:

These conclusions are in accordance with the results of previous research showing that, in the early stage of litter decomposition, the litter quality had the strongest influence on mass loss, whereas there was no significant effect of land-use or management practices. The microbial decomposition is carried out by many groups of microorganisms and is not limited by nutrients during the growing season. Still, differences in the litter mass loss among the land-use types increase in the later phases—as decomposition progresses—because of the decomposer groups being more selected, since fewer microbes possess the degradation enzymes for the remaining organic compounds. This pattern is clearer in Green tea, because Rooibos tea has much slower plant litter decomposition rate, due to high lignin content.

## **T1-P-8 First record of the endemic earthworm *Allolobophora (sensu lato) strumicae* (Šapkarev, 1973) (*Clitellata: Lumbricidae*) in Serbia, with comments on its ecology and distribution**

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**KEYWORDS:** earthworm; new record; *Allolobophora (sensu lato) strumicae*; Serbia;

### INTRODUCTION:

The earthworm fauna of Serbia is quite well-known. It is worth mentioning that most of the earlier research focused mainly on northern, central and eastern Serbia, and not many collecting expeditions were led to the areas of Kopaonik Mountain. The Kopaonik Mt. (43°16'N, 20°49'E) is situated between the central and southern part of Serbia and belongs to the Dinaric Mountain range.

### OBJECTIVES:

The aims of the present study are to provide information on the distribution of *Allolobophora (sensu lato) strumicae* (Šapkarev, 1973) in the country and in the adjacent areas of the Balkan Peninsula. In addition, we comment on the ecological preferences.

### METHOD / DESIGN:

The specimens for this study were collected during the period from 2018 to 2021, in the southwestern and southern slopes of Kopaonik Mt. They were collected using the diluted formaldehyde method complemented with digging (0.4 x 0.4 m<sup>2</sup>). The earthworms were killed in 70% ethanol, immediately fixed in 4% formalin solution and transferred and stored in 90% ethanol. Earthworms were identified to species level and only mature individuals were counted. All of the specimens collected and examined are permanently archived at either and the Earthworm Collection of the University of Kragujevac, Serbia (CEKUS).

### RESULTS:

Identified the earthworm material recently collected from this mountain range, resulting in a new record of the endemic species *All. (s.l.) strumicae*. The endemic earthworm species *All. (s.l.) strumicae* previously known only from the Strumica region in North Macedonia (Šapkarev, 1973; Mršić, 1991), is reported from the Serbia for the first time. Further, the new localities

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