

Title: Herbal tea mixtures: The synergy in the background**Elena Kurin*, Silvia Bittner Fialova, Eva Trajckova, Pavel Mucaji and Milan Nagy**

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Camellia sinensis Kuntze and Mentha × piperita L. are plants from different taxonomic orders. However, both enjoy great worldwide popularity for the well-known drinks prepared as a water infusion from their leaves: green tea and peppermint tea. Both plants are a rich source of polyphenols, known antioxidants that are the subject of research in medicinal plants and food stabilization as well. Most of the studies focus on investigating the effects of individual plants. But in combinations a hidden synergy can occur, mainly when the chemical composition of individual plants is different. Therefore, we explored the antioxidant activity of peppermint and green tea leaves lyophilizates, respectively. In addition, using different mixing method and different extract ratios we prepared lyophilized mixtures, which antioxidant activity was subsequently evaluated. Interaction analysis revealed the hidden synergy in several mixtures to quench the DPPH radical and in the DCF cell-based antioxidant assay. We also performed an interaction analysis of the combination of polyphenols present in the green tea (epigallocatechin gallate and quercetin) and peppermint tea (rosmarinic acid), respectively. We discovered synergy among polyphenols in the DPPH assay, which can partially enlighten the interaction of the lyophilizates on molecular level. Our work supports the old practice of combining the herbal substances into herbal tea mixtures, where the achieved effects are higher, than expected [Figure 1].

DPPH	CI	Description	DCF-DA	CI	Description	DPPH	CI	Description
lyo:GT:PM;3:2	1.07 ± 0.02	Nearly additive	lyo:GT:PM;3:2	0.60 ± 0.05	Synergism	Q+EGCG	0.87 ± 0.01	Slight synergism
GT:PM;1:1	0.97 ± 0.01	Nearly additive	GT:PM;1:1	0.70 ± 0.06	Synergism	Q+RA	0.71 ± 0.004	Moderate synergism
GT:PM;3:2	0.84 ± 0.01	Moderate synergism	GT:PM;3:2	0.83 ± 0.11	Moderate synergism	RA+EGCG	0.76 ± 0.01	Moderate synergism
						Q+RA+EGCG	0.67 ± 0.03	Synergism

Figure 1. Interaction analysis of CI value indicates synergy, additivity or antagonism, when it is <, = or > than 1. Each value error bars are expressed as ± SDA. Measured mixtures are abbreviated as common green tea and peppermint tea lyophilizate in 3:2 ratio (lyo:GT:PM;3:2), mixture of single green tea and peppermint lyophilizate in 1:1 or 3:2 ratio (GT:PM;1:1 or GT:PM;3:2). Polyphenols are abbreviated as epigallocatechin gallate (EGCG), quercetin (Q) and rosmarinic acid (RA). Antioxidant assays are abbreviated as 2,2-diphenyl-1-picrylhydrazyl scavenging (DPPH), dichlorodihydrofluorescein diacetate (DCF-DA).

Biography

Elena Kurin is a scientist and a teacher with strong, evidence based believes in plant medicine. She is an expert in the study of synergy, which appears to be responsible for the biological effects of many plant substances, present in nature in complex systems.