

Polycyclic aromatic hydrocarbons in traditionally used medicinal plants from Varna region, Bulgaria

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INTRODUCTION

Extracts of medicinal plants are included in food supplements, pharmaceutical products and cosmetics. The advantages of herbs are indisputable, but recent research showed that they may contain toxic substances, such as Polycyclic aromatic hydrocarbons.

AIM

Determination and comparison the levels of PAHs in traditionally used medicinal plants - chamomile (*Matricaria chamomilla* L.), white yarrow (*Achillea millefolium* L.), linden (*Tilia* L.), elder (*Sambucus nigra* L.) and thyme (*Thymus serpyllum* L.) collected from a rural region and a suburban area (town of Varna).

SAMPLING

Samples were collected manually from urban (Varna) and rural (Fichoza) regions near Varna, Bulgaria from their natural habitats in the months of May - July 2018.

Table 1. Levels of the 4 regulated PAHs (µg/kg dw) in medicinal plants

	Benzo[a]anthracene	Chrysene	Benzo[b]fluoranthene	Benzo[a]pyrene
<i>Tilia</i> L. (n=6)				
rural region	<LOD	1.43 ± 0.07	<LOD	<LOD
urban area	0.52 ± 0.10	6.30 ± 0.30	<LOD	<LOD
<i>A. millefolium</i> L. (n=5)				
rural region	<LOD	2.37 ± 0.12	<LOD	<LOD
urban area	<LOD	5.43 ± 0.10	<LOD	<LOD
<i>Sambucus nigra</i> L. (n=6)				
rural region	<LOD	0.68 ± 0.11	<LOD	<LOD
urban area	<LOD	5.04 ± 0.09	<LOD	<LOD
<i>Thymus serpyllum</i> L. (n=4)				
rural region	<LOD	0.82 ± 0.08	<LOD	<LOD
urban area	<LOD	3.96 ± 0.11	<LOD	<LOD
<i>M. chamomilla</i> L. (n=5)				
rural region	<LOD	0.86 ± 0.08	<LOD	<LOD
urban area	<LOD	1.80 ± 0.07	<LOD	<LOD

<LOD - below limit of detection

RESULTS

- PAHs with 3 rings (phenanthrene, fluorene, anthracene) were predominant in all plant species and account for 96.8-98.7% of the total PAHs content, while PAHs with 4 rings (benzo[a]anthracene, chrysene, pyrene) and 6 rings (benzo[ghi]perylene) were found below 2%.

- The sum of 4 PAHs in medicinal plants was found significantly higher in samples from areas with intensive traffic (urban area) compared to samples from rural region, probably due to heavy car traffic as the main source of PAHs.

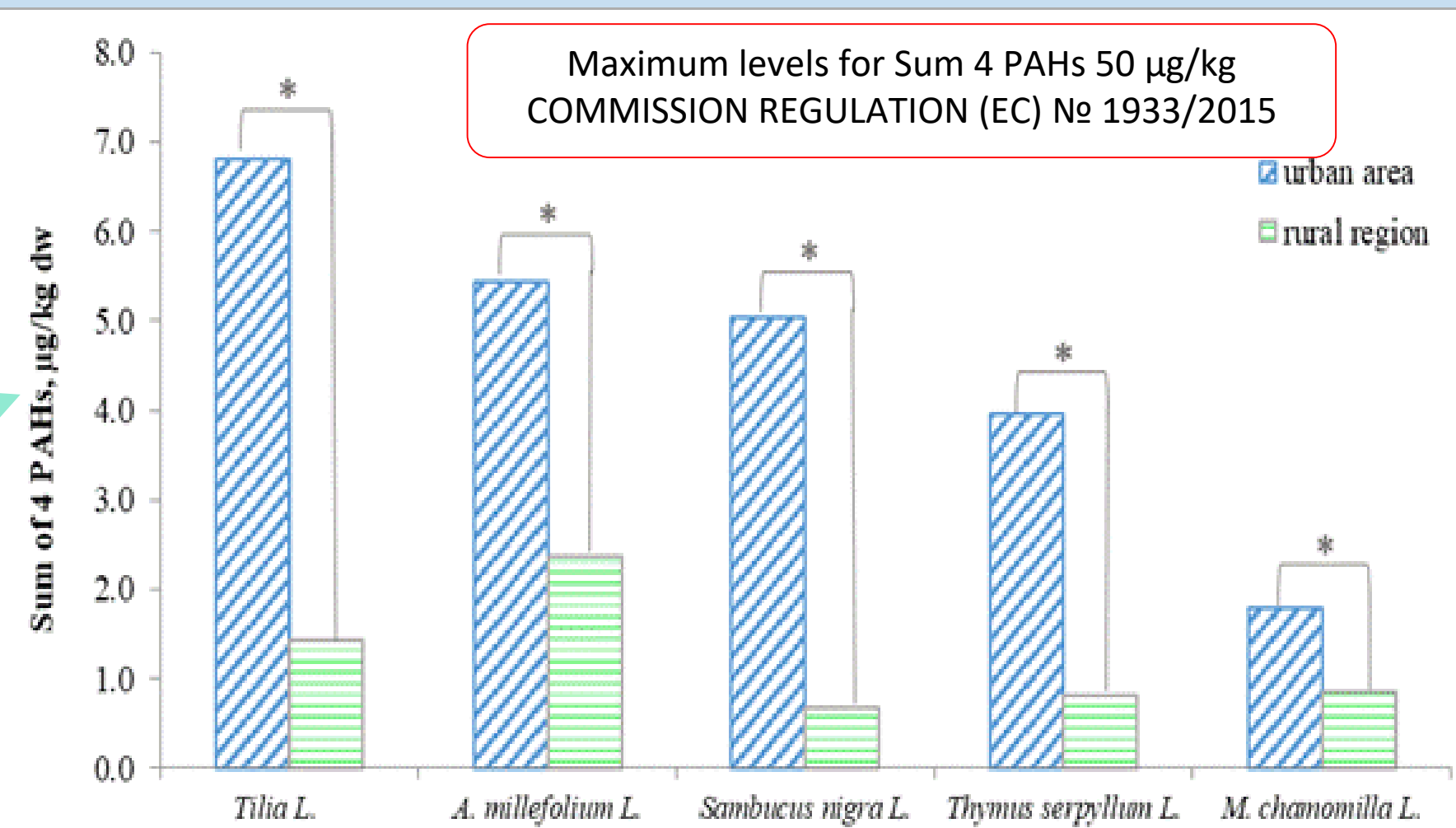


Fig. 2 The sum of 4 PAHs in samples from areas with intensive traffic and from suburban areas (* - $p < 0.05$)

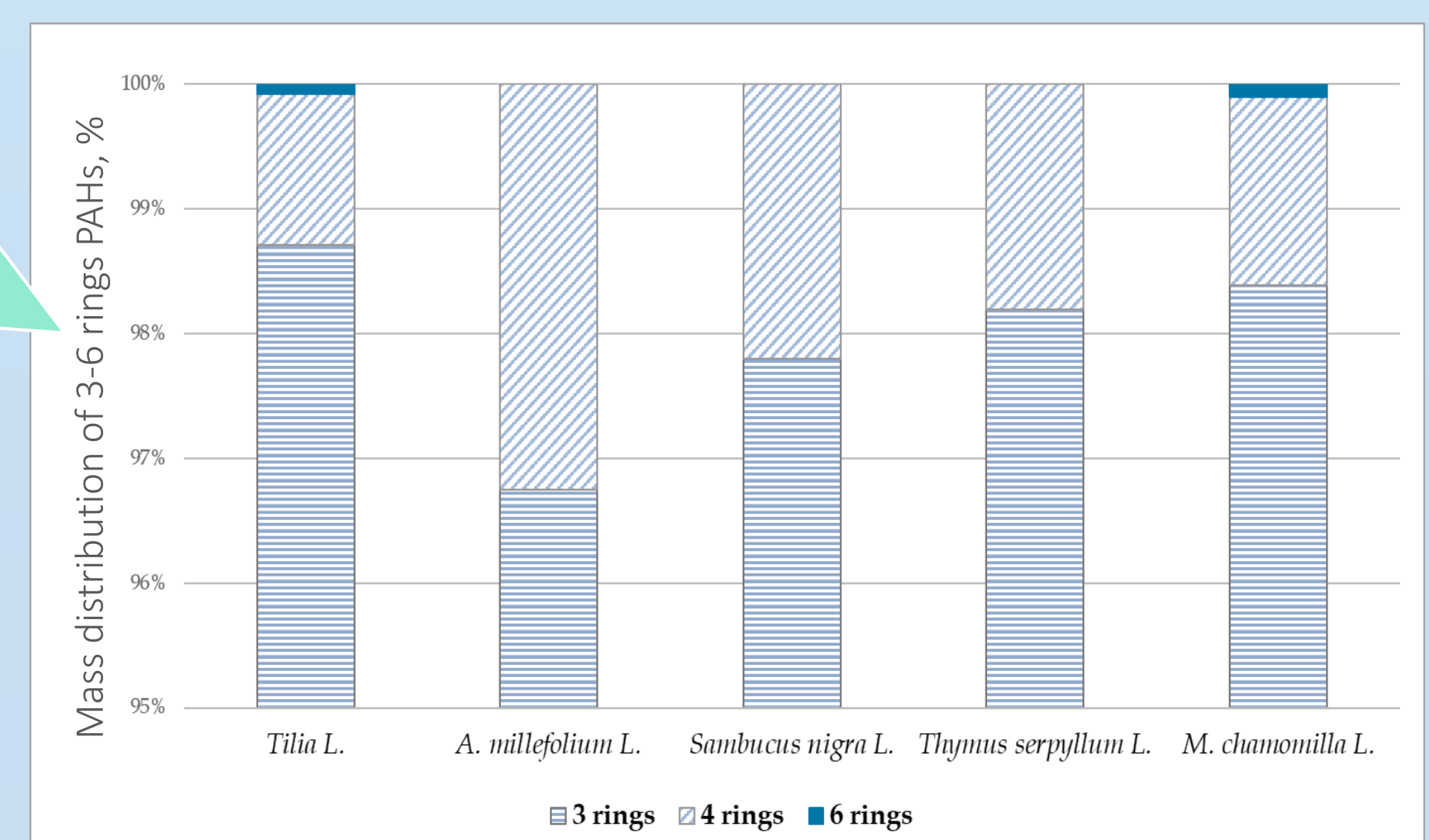


Fig. 1 Distribution pattern of PAHs with 3-6 rings in plant species from urban area

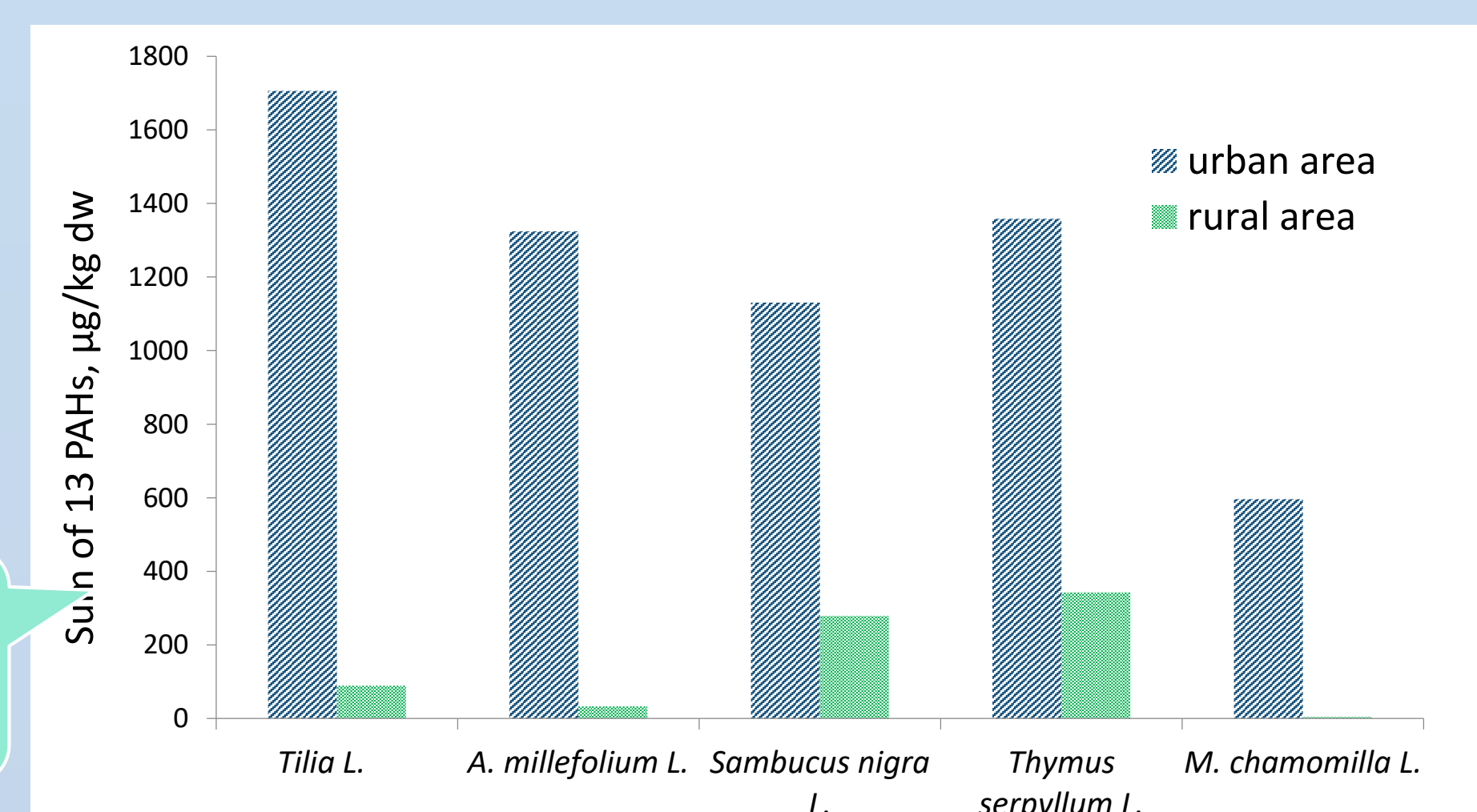


Fig. 3 The sum of 13 PAHs in samples from areas with intensive traffic and from suburban areas

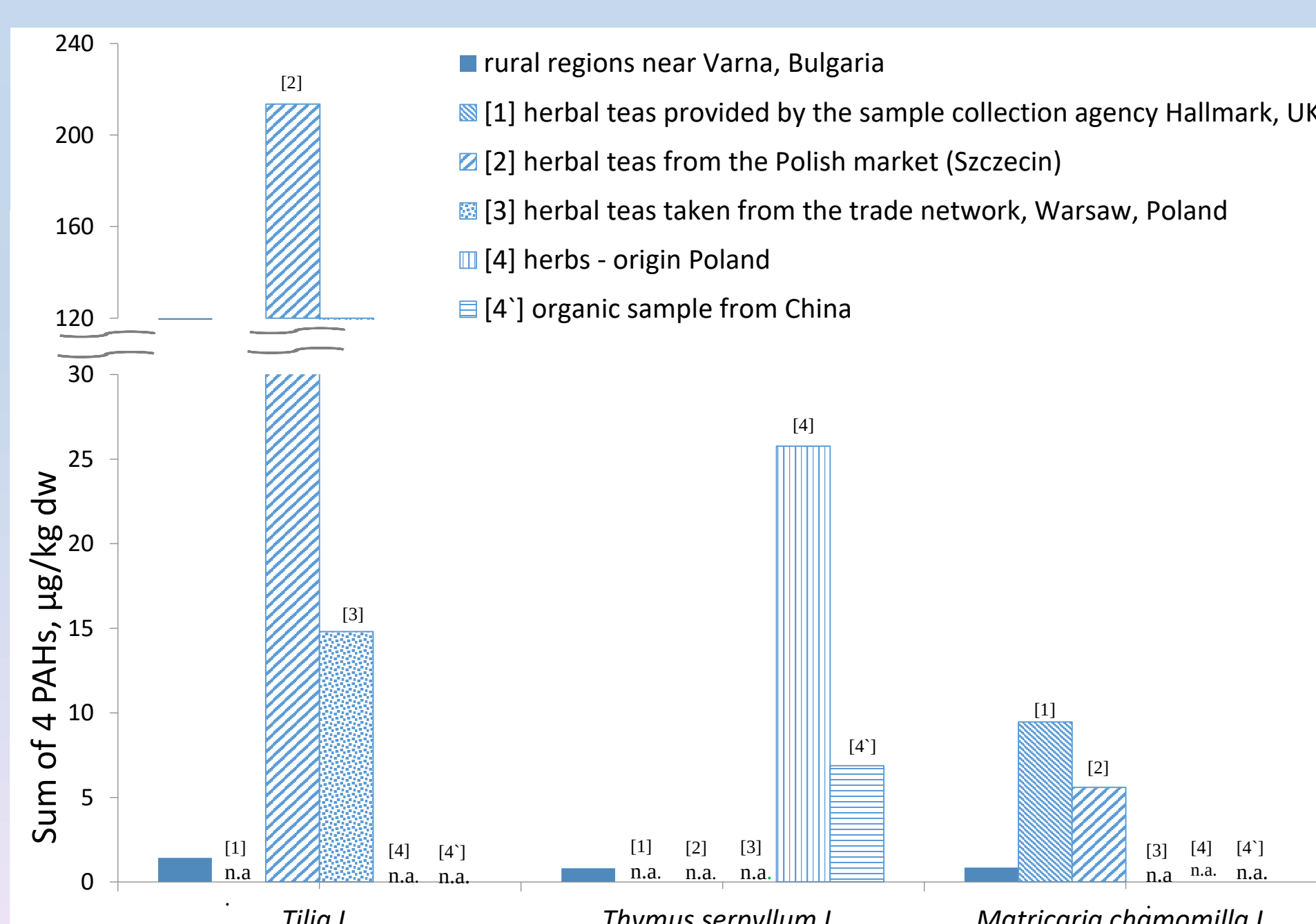


Fig. 4 Comparison of Sum of 4 PAHs in dried herbs from rural regions near Varna, Bulgaria and data from other authors

CONCLUSIONS:

- The maximum overall PAH's contamination was found for Tilla L., while Matricara chamomilla L. proved to have the minimum contamination.
- The sum of 4 PAHs in all traditionally used medicinal plant did not exceed the permissible limit of the European commission - 50 µg/kg.

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