

Research article

First records of *Stegonsporium pyriforme* (Hoffm.) Corda and *Massaria macra* (Vestergr.) Voglmayr & Jaklitsch on *Acer platanoides* L. and *A. campestre* L. in Bulgaria

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Abstract: In presents study, *Stegonsporium pyriforme* (Hoffm.) Corda and *Massaria macra* (Vestergr.) Voglmayr & Jaklitsch were recorded for the first time in Bulgaria. Symptomatic trees of *Acer platanoides* L. and *A. campestre* L. were noticed in 2024 in the field protective forest belts of the State Hunting Enterprise Balchik, Northeastern Bulgaria. Both pathogens were found on dying and dead trees heavily infected by the fungus *Cryptostroma corticale* (Ellis & Everh.) Greg. & Waller, the causative agent of sooty bark disease. Two micetophagous coleopteran species were found under the bark of dead maple trees: *Colobicus hirtus* (Rossi, 1790) and *Synchita undata* Guérin-Méneville, 1844 (Coleoptera: Zopheridae).

Keywords: *Acer* spp., *Cryptostroma corticale*, field protective forest belts, *Massaria macra*, Southern Dobrudzha, *Stegonsporium pyriforme*

Introduction

The health status of maple species (*Acer pseudo-platanus* L., *A. platanoides* L. and *A. campestre* L.), planted in the field protective forest belts in Southern Dobrudzha (Northeastern Bulgaria), was assessed in 2024. During the study, the ascomycetous fungi *Stegonsporium pyriforme* (Hoffm.) Corda and *Massaria macra* (Vestergr.) Voglmayr & Jaklitsch were found on dying and dead trees, heavily infected by the fungal pathogen *Cryptostroma corticale* (Ellis & Everh.) Greg. & Waller (Ascomycota, Xylariaceae), caused sooty bark disease. *C. corticale* was first identified in an urban park in Bulgaria in 2014 (Bencheva, 2014). Since then, the pathogen has primarily spread throughout urban green spaces

nationwide. In 2023, it was detected causing significant damage and reducing maple trees vitality in the field protective forest belts in Southern Dobrudzha (Georgieva et al., 2024).

Stegonsporium pyriforme (Ascomycota, Pleo-massariaceae), with its sexual stage identified as *Prosthecium pyriforme* Jaklitsch & Voglmayr, is responsible for branch dieback in maple species (*Acer* spp.) across Europe, particularly affecting *A. pseudo-platanus* (Nageleisen, 1994; Tomiczek et al., 2005; Voglmayr & Jaklitsch, 2008). This fungus is mainly regarded as a weak parasite, predominantly occurring on dead trees, especially those previously infected by *C. corticale* (Lorenc, 2024). Voglmayr & Jaklitsch (2008) classify *S. pyriforme* as an opportunistic, moderately phytopathogenic coelomycete confined to

Table 1. Characteristics of sample plots observed in the State Hunting Enterprise Balchik.

Locality	Tree species	Date of observation	Latitude, °	Longitude, °	Altitude, m	Age, years
Hadzhi Dimitar	<i>A. pseudoplatanus</i>	15.05.2024	43.456667	28.427500	106	22
Kremena	<i>A. pseudoplatanus</i>	07.06.2024	43.560556	28.141111	210	71
Seltse	<i>A. platanoides</i>	27.05.2024	43.477055	28.305555	140	21
Trigortsi	<i>A. platanoides</i>	23.10.2024	43.522777	28.187222	200	41
Dropla	<i>A. platanoides</i>	24.10.2024	43.582777	28.079722	225	71
Dropla	<i>A. platanoides</i>	24.10.2024	43.592500	28.116666	215	71
Dropla	<i>A. platanoides</i>	24.10.2024	43.592500	28.126944	205	71
Dropla	<i>A. platanoides</i>	24.10.2024	43.585000	28.101944	215	71
Dropla	<i>A. campestre</i>	24.10.2024	43.572500	28.068055	215	51

Europe, with no presence in North America, while *S. acerinum* is limited to North America and absent from Europe. Tomiczek et al. (2005) reported that *S. pyriforme*-induced dieback of branches and twigs can result in the mortality of young plants.

Massaria macra (Ascomycota, Massariaceae) occurs on *A. campestre* and *A. platanoides* throughout Europe, especially in Sweden, Norway, Finland, Estonia, Austria, Italy, Germany, and France. While *M. macra* is predominantly found on recently cut or broken branches lying on the ground, it has also been observed on branches still attached to the tree (Voglmayr & Jaklitsch, 2011).

This note aims to announce the first record of two ascomycetous fungi, *Stegonsporium pyriforme* and *Massaria macra*, which were found on *Acer* spp. planted in field protective forest belts in Northeastern Bulgaria.

Materials and methods

Between May and October 2024, we observed the health status of *Acer* species (360 trees, aged 21 to 71 years) in nine field protective forest belts within the territory of the State Hunting Enterprise (SHE) Balchik (Table 1). Subsequently, sample trees underwent evaluation for defoliation and damage extent, following the ICP 'Forests' methodology (Eichhorn et al., 2020).

The materials for fungal infection observations were collected from trees with necrosis and fruit bodies on the trunks and branches, and transported to

the Forest Research Institute in Sofia. Samples were surface-washed with tap water, sterilised for 1 min in 96% ethanol, and then rinsed once in sterile distilled water. Sterilised parts were placed on moistened filter paper in Petri dishes and incubated at 22±2 °C under artificial light.

The fungal species were identified using microscopic methods. Morphological characteristics of the fruit bodies were observed at 40× magnification with a Zeiss Stemi 305 stereomicroscope, fitted with a DinoEye AM-423X digital camera and an ocular micrometre. The shape and size of 100 asci and ascospores were measured using an OPTIKA Microscope B810, also equipped with a digital camera. The identification of *S. pyriforme* was based on the key by Voglmayr & Jaklitsch (2008), while *M. macra* was identified using the key by Voglmayr & Jaklitsch (2011).

Results

An extensive decline from sooty bark disease affected nine field protective forest belts in the SHE Balchik (Table 1) among *A. pseudoplatanus* (22 and 71 years old), *A. platanoides* (21–71 years old), and *A. campestre* (51 years old). The fungal pathogen *Cryptostroma corticale* infected all maple species, causing the death of all trees in Hadzhi Dimitar and Kremena villages (Table 2) and defoliation of 70%–100% (average 91.4%) in other locations. Sooty bark disease led to tree and branch death in all observed maple trees.

Table 2. Fungal pathogens identified in the sample plots in the State Hunting Enterprise Balchik.

N	Locality	Tree species	Fungal pathogen	Defoliation, %
1	Hadzhi Dimitar	<i>A. pseudoplatanus</i>	<i>C. corticale</i>	100
2	Kremena	<i>A. pseudoplatanus</i>	<i>C. corticale</i>	100
3	Seltse	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i> , <i>M. macra</i>	70–100
4	Trigortsi	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i> , <i>M. macra</i> , <i>Fusarium</i> sp.	90–100
5	Dropla	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i>	80–100
6	Dropla	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i>	90–100
7	Dropla	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i> , <i>M. macra</i>	80–100
8	Dropla	<i>A. platanoides</i>	<i>C. corticale</i> , <i>S. pyriforme</i> , <i>M. macra</i>	80–100
9	Dropla	<i>A. campestre</i>	<i>C. corticale</i> , <i>S. pyriforme</i> , <i>M. macra</i>	70–100

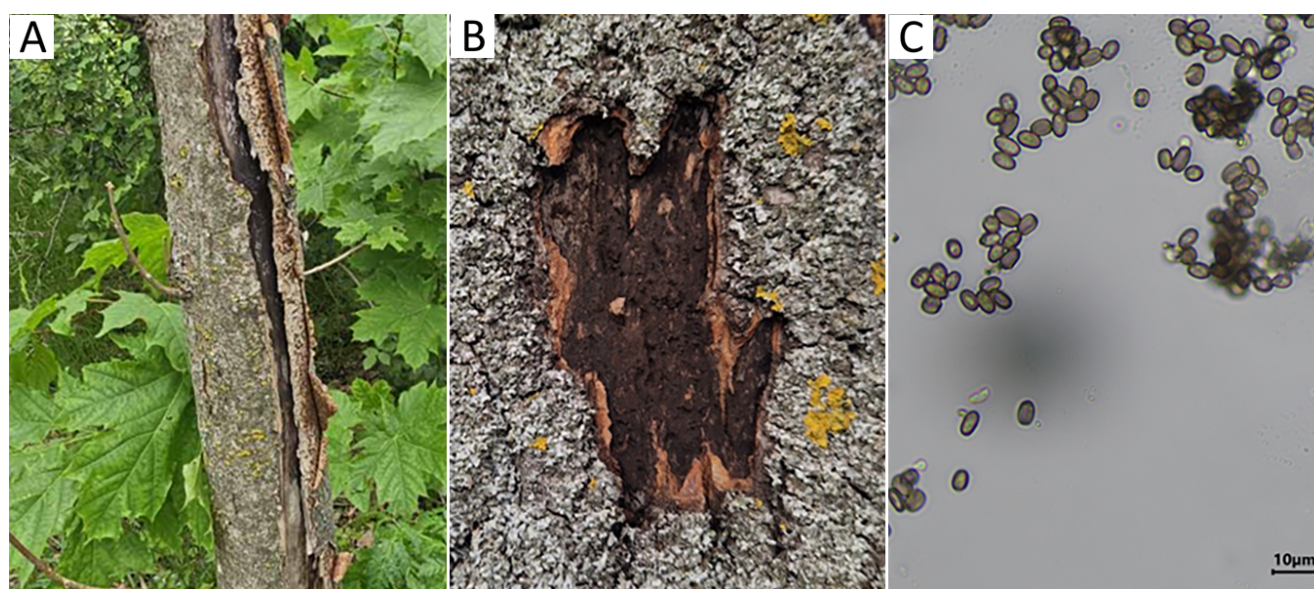


Fig. 1. *Cryptostroma corticale* infected trunk on *Acer pseudoplatanus* tree (Kremena Village, 7.06.2024): A) fungal growth beneath the bark; B) dense sooty fungal growth; C) conidia of fungus.

Symptoms of sooty bark disease appeared as stripes on infected parts, revealing black areas beneath the bark (Fig. 1A). The bark had long cracks and peeled easily, exposing dense masses of dark brown conidia (Fig. 1B). Ovoid, light to dark brown conidia ($4.5\text{--}6.5 \times 3.3\text{--}4.2 \text{ }\mu\text{m}$) arose from the conidiomata (Fig. 1C).

Dead stems with lesions were found on infected *A. platanoides* trees in Seltse (Fig. 2A) and Trigortsi villages, and in five field protective belts in the vicinity of Dropla Village. The fruit bodies of ascomycetous fungus *Stegonsporium pyriforme* were

noticed on the stems killed by the fungus *C. corticale* (Fig. 2B). The findings revealed that the presence of *C. corticale* and *S. pyriforme* occurred significantly on dead trees. In Trigortsi Village, conidia of *Fusarium* sp. were observed together with conidia of *S. pyriforme*.

Stegonsporium pyriforme formed fruit body sized 1.1–3.2 mm ($n=30$), penetrated the bark from the inside, forming black spots of sporulation on the bark (Fig. 2C). A high percentage of infection was detected in the May 2024 in the field protective forest belts in Seltse, Trigortsi and Dropla villages. Orange, pear-

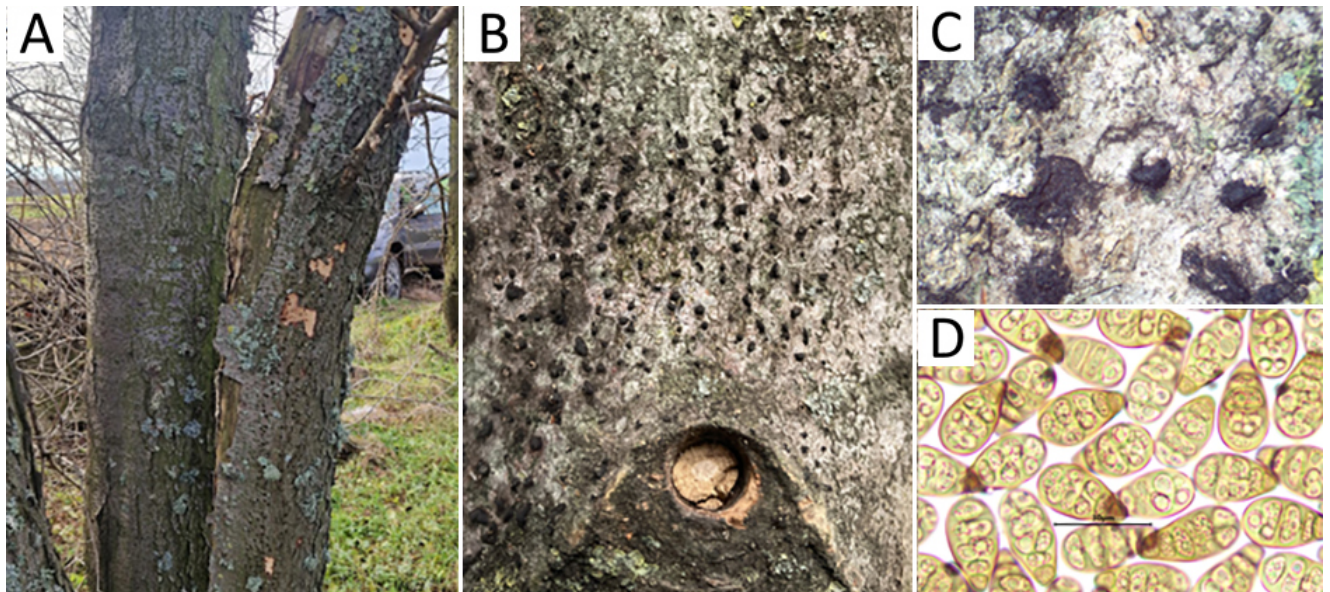


Fig. 2. *Acer platanoides* trees in the field protective forest belt (Seltse Village, 27.05.2024): A) Sooty bark disease; B, C) *Stegосporium pyriforme* fruit bodies; D) conidia.

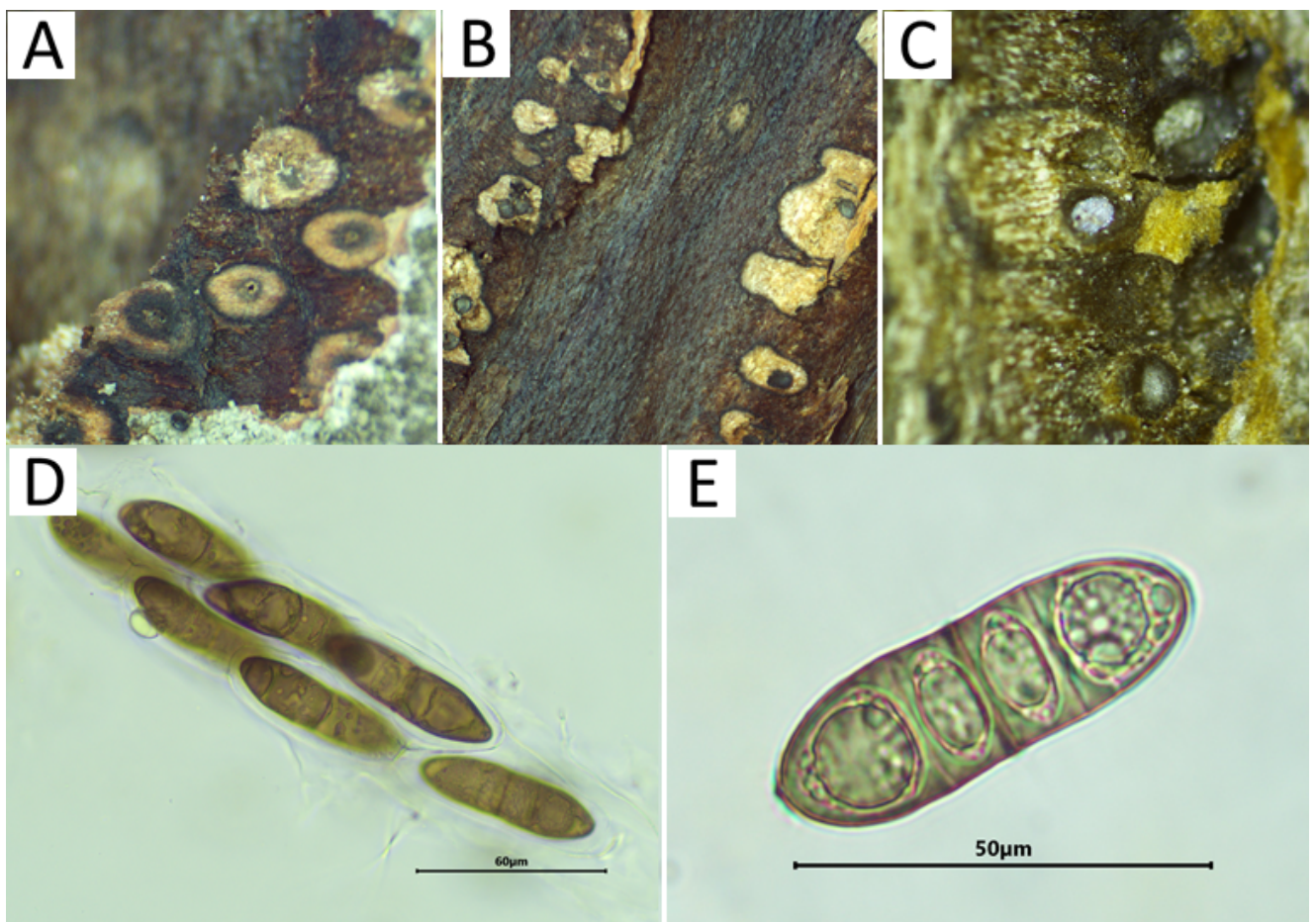


Fig. 3. *Massaria macra* on *Acer platanoides*: A) pseudostroma with perithecia; B–C) pseudothecia surrounded by pallid pseudostroma and black zone in transverse section surface of mycelium; D–E) ascospores.

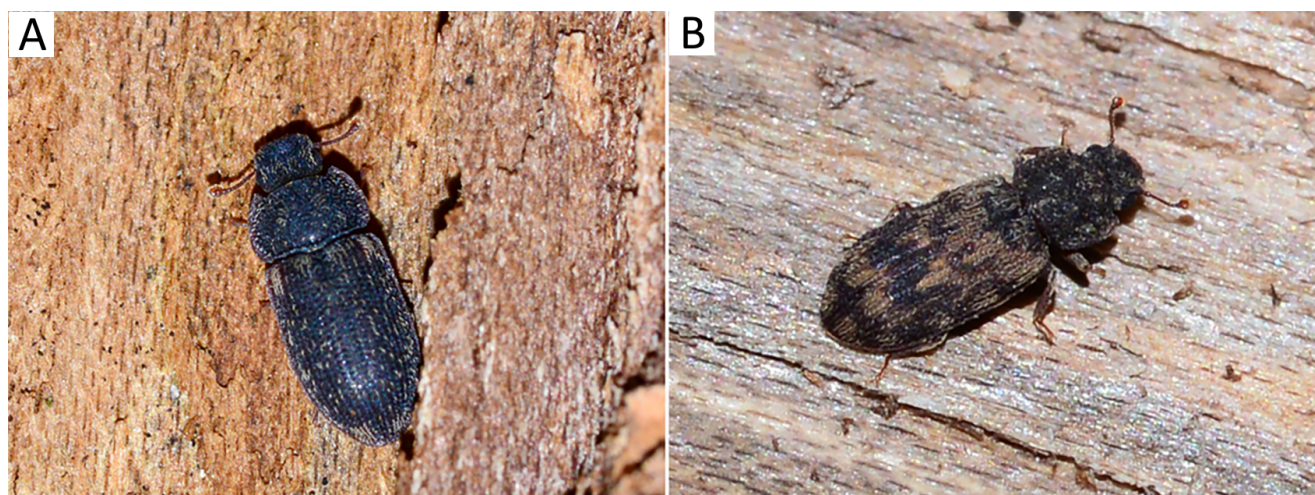


Fig. 4. Micetophagous insects found under the bark of dead maple trees: A) *Colobicus hirtus* on *Acer campestre* (Dropla Village, 22.11.2024); B) *Synchita undata* on *Acer platanoides* (Trigortsi Village, 29.10.2024).

shaped conidia measuring $28.5\text{--}48.3 \times 14.5\text{--}21.2\text{ }\mu\text{m}$ were formed inside the fruit bodies (Fig. 2D).

During the survey, fruit bodies of the ascomycete *Massaria macra* were observed on stems and branches of *A. platanoides* and *A. campestre* killed by the fungal pathogen *C. corticale* (Table 2). In areas where fruiting bodies developed, the wood exhibited yellow colouration (Fig. 4A–C). The oblong-cylindrical fungal asci, measuring $217.3\text{--}320.1 \times 33.5\text{--}48.5\text{ }\mu\text{m}$ ($n=100$), contained eight ascospores (Fig. 4D). These ascospores were elliptical, $49.09\text{--}70.7 \times 16.1\text{--}18.2\text{ }\mu\text{m}$ ($n=100$), and pale yellowish, becoming dark brown after separation from the asci. They possessed three septa with rounded terminal cells (Fig. 4E).

Two micetophagous coleopteran species were found under the bark of dead maple trees: *Colobicus hirtus* (Rossi, 1790) (Fig. 4A) and *Synchita undata* Guérin-Ménéville, 1844 (Coleoptera: Zopheridae) (Fig. 4B).

Discussion

Since *Cryptostroma corticale* was first reported in Bulgaria (Bencheva, 2014), it has spread throughout the country, causing damage to *A. pseudoplatanus* and *A. platanoides* trees mainly in urban green areas (Georgiev et al., 2017; Ivanov et al., 2026). It has also affected field protective forest belts in Northeastern Bulgaria (Georgieva et al. 2025). In the present study, for the first time, symptoms of the disease were

observed on *A. campestre* near Dropla Village. The intensive development of the pathogen in the branches and stems of infected trees was favoured by high temperatures and insufficient precipitation during recent growing seasons.

Stegonsporium pyriforme was confirmed for the first time on *A. platanoides* and *A. campestre* in field protective forest belts in Northeastern Bulgaria. This fungus is considered a weak pathogen of maple species (Voglmayr & Jaklitsch, 2008, 2014; Bußkamp et al., 2024) and typically attacks already weakened trees (Sinclair & Lyon, 2005). *Stegonsporium* species cause wilt symptoms, crown dieback, bark necrosis, and minor dieback of shoots, twigs, and branches (Voglmayr & Jaklitsch, 2008). Currently, the presence of *S. pyriforme* on dead trees in these forest belts in Northeastern Bulgaria is low.

The fungus *Massaria macra* was reported for the first time in Bulgaria in this study. It occurred on dead stems and branches of *A. platanoides* and *A. campestre* trees. Other representative species of the *Massaria* genus – *Massaria campestris* Voglmayr & Jaklitsch was recently recorded on *A. campestre* in Bulgaria (Sabovljević et al., 2022).

Colobicus hirtus and *Synchita undata* are relatively rare species in Bulgaria (Guéorguiev et al., 2026). For *C. hirtus*, records indicate its presence under the bark of dead *Quercus suber* L. trees in Southwestern Bulgaria (Bencheva & Doychev, 2022), as well as under the bark of *Tilia platyphyllos* Scopoli and *A. campestre* within field protective forest belts in South Dobrudzha (Guéorguiev et al., 2026). In

contrast, *S. undata* has been found under the bark of a dead *Pseudotsuga menziesii* tree in Belasitsa Mountain and under an *A. platanoides* tree in South Dobrudzha (Guéorguiev et al., 2026).

Conclusions

In the present study, the ascomycetous fungi *Stegonsporium pyriforme* and *Massaria macra* were recorded for the first time in Bulgaria. The appearance of weak pathogens *S. pyriforme* and *M. macra* on *Acer platanoides* and *A. campestre* in the field protective forest belts in northeastern Bulgaria is probably due to the severe dieback caused by the invasive pathogen *Cryptostroma corticale* and the physiological weakening of trees because of the long-term period of lack of precipitation during the last growing seasons.

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Conflicts of interest

No potential conflict of interest has been reported by the authors, reviewers, or subject editor.

Author’ contributions

(using [CrediT](#))

Veselin Ivanov: data curation, investigation, resources, visualisation, writing—original draft; Tsvetan Dimitrov: investigation, resources,

visualisation; Margarita Georgieva: data curation, investigation, methodology, resources, writing—original draft; Georgi Georgiev: data curation, investigation, methodology, resources, visualisation, writing—original draft; Denitsa Petrova: resources.

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