

Notes on the distribution of *Alkanna tinctoria* (L.) Tausch in Bulgaria

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Introduction

Alkanna tinctoria (L.) Tausch (alkanet) is a medicinal plant native to the Southern Europe, Northern Africa and Southwestern Asia.

In Bulgaria, *A. tinctoria* is a protected plant with fragmented populations mainly in southwestern and southeastern parts of the country. It is included in the Red Data Book of Bulgaria (Evstatieva, 2015), in the Red List of vascular plants (Petrova and Vladimirov, 2009) in the "endangered species" category, and in Annex 3 of the Bulgarian Biodiversity Act (BDA, 2002) for species prohibited for harvesting from their natural habitats. There are no actual data on the distribution of the species on the territory of the country.

The aim is to study the current distribution of the species and the status of its populations in Bulgaria.

Material and methods

The distribution of the species was investigated using route and stationary methods. In the 2019 growing season, field studies were conducted in the floristic regions of Valley of River Struma, Danubian Plain, Tundzha Hilly Country, Thracian Lowland, Eastern Rhodopes Mts and Strandzha Mts.

Population monitoring was performed through observations according to the "Methodology for Monitoring of vascular plants" and "Methodology for Assessment of the state of vascular plants" by the NBMS (National Biodiversity Monitoring System (<http://eea.government.bg/en/nsmos>), taking into account the floristic area, phenological phase, GPS coordinates, habitat characteristics, population density, projective coverage, presence of invasive species, threats and natural phenomena. The data is submitted on unified and approved by MOEW forms.

The available herbarium specimens of *A. tinctoria* in the Bulgarian collections have been reviewed (76 numbers in total). A chorological reference on the distribution of the species in Bulgaria has been done according to literature data.

Results and discussion

As result of the field survey carried out, the location, spatial structure, size and age structure of the populations were established. A map of the current distribution of the species on the territory of the country has been elaborated.

The literature review and herbarium specimens revealed that the species is distributed in seven

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floristic regions of the country – Valley of River Struma, Thracian Lowland, Tundzha Hilly Country, Pirin Mts (Southern), Eastern Rhodopes Mts, Strandzha Mts and Danubian Plain (Kozuharov, 1989, Evstatieva, 2015).

During our visits in the above cited floristic regions, 17 populations of *A. tinctoria* were found: 14 between Kresna town and Kulata village (Struma valley and Pirin Mt), and 3 in southeastern Bulgaria (Eastern Rhodopes Mts). The localities in Danubian Plain, Thracian Lowland, Tundzha Hilly Country, Strandzha Mts. and some of this in southeastern Bulgaria noticed in literature sources and herbarium specimens have not been confirmed. Probably, the reason for their disappearance is the change in the habitat conditions as a result of their abandonment (as the established in the population at village Orsoya, near the town of Lom) or burning (observed in the population at village Archar in Danubian Plain).

On the base of the population localized, it was found that the species' habitats are located in three floristic regions of the country: Valley of River Struma, Pirin Mts (Southern) and Rhodopi Mts. (Eastern). The populations are fragmented and located in open grassy or shrub communities on sandy, poorly eroded terrains. The same characteristics of the *Alkanna tinctoria* habitats were described for the Hungarian flora (Pluhar et al., 2001). The authors pointed out the species as tolerant plant that requires warmth, long duration of sunshine in the vegetation period and calciferous soils, poor in humus coincide with our observations on the Bulgarian populations. The requirements of *A. tinctoria* explain its occurrence on limestone rocks in the Mediterranean region that is central region of distribution of the species, or on loose sandy stream deposits such that were found in Hungarian and Bulgarian populations. In the cited countries *A. tinctoria* is representative element of the submediterranean flora. This showed that the species have specific requirements to the environmental conditions that determine its distribution.

Concerning the age structure of the monitored populations, our observations showed that in them predominated the generative individuals. The main threat established was the trampling from herds of small and large cattle grazing on their territory, as

they are all located near settlements, arable lands and roads.

Conclusion

During the present study, the localization of the populations of *Alkanna tinctoria* in Bulgaria and their state were established. It was confirmed the limited distribution of the species on the territory of the country. The reason for this is the specific requirements to the environmental conditions on the one hand, and the disappearance of populations under anthropogenic pressure on the other hand. In this respect, it may be appropriate, in addition to the measures taken so far to protect the species, such as its inclusion in the Red Data Book of Bulgaria, Red List of Higher Plants and Biodiversity Act, to enterprise activities on protection of the localities of the species by declaring them protected areas.

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