CURRENT STATUS AND MAJOR THREATS TO THE TAKHTAJANIANTHA TAU-SAGHYZ POPULATION IN THE ARBAG‘ISH FOOTHILLS

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Abstract. Takhtajaniantha tau-saghyz is a perennial latex-producing plant belonging to the tribe Cichorieae of the family Asteraceae and is distributed across Central Asia. Its foothill populations require particular attention due to their restricted habitats and increasing anthropogenic pressure associated with land use. This study aimed to assess the current status of the remaining population in the Arbag‘ish foothills of Chortoq District, Namangan Region, Uzbekistan. Field surveys were conducted annually from late March to early July during 2023–2026. The methods employed included GPS recording, repeated transect surveys, direct individual counts, and documentation of habitat disturbances. The surveyed area was recorded at coordinates 41.263533° N, 71.899600° E, within an elevational range of 1,080–1,230 m above sea level. Based on field counts, the population was estimated to comprise approximately 500–600 individuals. The occurrence of the species across four consecutive field seasons confirms its continued presence at the surveyed sites; however, the available data are insufficient to determine population trends. The principal threats identified include livestock grazing and trampling, gravel extraction, land ploughing, road development, and construction activities. Seasonal drought and variability in precipitation may further exacerbate these pressures. Recommended conservation measures include delineating key habitat areas, restricting excavation activities at sites occupied by the species, implementing seasonal livestock grazing management, conducting annual monitoring along permanent survey transects, and establishing a limited ex situ seed reserve. These findings provide preliminary field-based evidence on an understudied population in Uzbekistan and support the development of targeted local conservation measures.

Keywords: Arbag‘ish foothills; Central Asia; conservation; population monitoring; rare plant species; anthropogenic pressure; Takhtajaniantha tau-saghyz.

Introduction. Mountain and foothill landscapes harbour numerous geographically restricted taxa. These environments are particularly vulnerable to habitat fragmentation, livestock grazing, extraction of construction materials, and climatic variability. Their biological significance is determined not only by species diversity but also by the persistence of small and isolated populations. The loss of such populations may result in the irreversible depletion of unique local genetic resources [4]. In Central Asia, site-specific field observations are particularly important because repeated population-level data remain insufficient for many rare plant species.

Takhtajaniantha tau-saghyz (Asteraceae, Cichorieae) is a perennial plant native to Central Asia that was historically recorded under the name Scorzonera tau-saghyz. Early studies highlighted the presence of latex in its underground organs and its potential as an alternative source of natural rubber [1, 7]. Subsequent floristic and systematic studies incorporated the species into regional identification keys and reassessed its generic placement [3, 5, 6, 8–10]. Recent molecular phylogenetic and carpological evidence supports its placement within the genus Takhtajaniantha [10]. This taxonomic clarification is also important for conservation efforts, as historical field records published under earlier names must be accurately linked to the currently accepted nomenclature.

Despite the botanical and historical significance of the species, publicly available and systematically collected information on the current status of certain populations in Uzbekistan remains limited. A population persists in the Arbag‘ish foothills of Namangan Region, where it is exposed to various forms of human activity. The objectives of this study were to document the location and

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estimated abundance of this population, identify the principal threats recorded during repeated field surveys, and propose priority measures for long-term monitoring and local conservation.

Study area and methods. Field investigations were conducted in the Arbag‘ish foothills of Chortoq District, Namangan Region, Uzbekistan. Surveys were repeated annually in 2023, 2024, 2025, and 2026, from late March to early July, encompassing the period of active seasonal growth and development of the species. The study area is located near 41.263533° N and 71.899600° E, at a recorded elevation of 1,080–1,230 m above sea level. Geographic coordinates and elevation were recorded using GPS and subsequently verified during follow-up visits.

Population status was assessed through a combination of transect-based field surveys, repeated inspections of selected sites, and direct counts of individuals. Visible groups of plants were counted in situ, and the overall population estimate was expressed as a numerical range to reflect the approximate nature of the field assessment. This range should not be interpreted as a statistical confidence interval. The presence of the species across consecutive field seasons, its spatial distribution within the surveyed area, and evidence of livestock grazing, trampling, gravel extraction, soil disturbance, ploughing, road development, and construction activities were documented. Phenological observations were used to determine appropriate periods for repeated surveys; however, a comprehensive demographic model was not developed.

The present assessment is descriptive and site-specific. It should not be interpreted as a comprehensive census of the species across Uzbekistan or as a formal Red List assessment. The terms ‘pressure’ and ‘threat’ refer to disturbances observed within or immediately adjacent to habitats occupied by the species, together with their potential effects on individual survival, natural regeneration, and habitat integrity. This approach enables conservation planning based on the precautionary principle while explicitly acknowledging the limitations of the available data [2].

Results and discussion. The Takhtajaniantha tau-saghyz population in Arbag‘ish was recorded during all four field seasons of the study period. The number of individuals within the surveyed sites was estimated at approximately 500–600. This estimate does not represent separate annual counts for each of the four years or an established trend in population abundance. The natural habitat and general appearance of the species are illustrated in Figure 1.

The occurrence of the species across consecutive field seasons confirms its continued presence at the surveyed locations. However, individuals were not continuously distributed across the broader landscape but were concentrated within a restricted geographical and elevational range. Therefore, population abundance alone should not be considered an indication of population security. When habitats are simultaneously subjected to livestock grazing, excavation, agricultural activities, or infrastructure development, local populations may experience substantial damage within a relatively short period.

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Evidence of livestock grazing and trampling was repeatedly observed during field visits; however, the relative magnitude of these pressures compared with other threats was not quantitatively assessed. Adult perennial plants may persist under moderate grazing pressure, whereas repeated trampling can damage reproductive shoots, reduce seed production, compact surface soils, and adversely affect juvenile individuals. Because damage to inflorescences may limit seed production, such disturbances require particular attention during the reproductive period.

Figure 1. Takhtajaniantha tau-saghyz in its natural habitat in the Arbag‘ish foothills (Chortoq District, Namangan Region).

A second category of threats is associated with the mechanical disturbance and alteration of the



substrate. Gravel extraction, ploughing, road development, and construction activities can remove entire plants together with the soil layers containing their root systems, while also fragmenting the remaining habitat patches. Consequently, these activities pose a greater potential threat to population persistence than temporary damage to above-ground plant structures.

Seasonal drought and irregular precipitation patterns were considered additional ecological stress factors rather than independently quantified drivers of population decline. During drought years, seedling emergence, flowering, and seedling survival may be reduced in geographically restricted foothill populations. When combined with livestock grazing pressure or the removal of surface soil layers, these conditions may further compromise the population's capacity for natural regeneration. Continued monitoring over several additional years is necessary to distinguish natural interannual variability from sustained population decline. Accordingly, the estimated abundance of 500–600 individuals may serve as a preliminary descriptive baseline for comparison with future population counts, provided that consistent survey routes, seasonal sampling periods, and counting protocols are maintained.

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Table 1. Field Characteristics of the Arbag'ish Population and Their Conservation Implications

Parameter	Field Observations	Interpretation	Priority Conservation Measure
Survey period	Late March–early July, 2023–2026	Baseline data collected over four field seasons	Repeat surveys annually during the same seasonal period
Location	41.263533° N, 71.899600° E; 1,080–1,230 m a.s.l.	Restricted habitat range	Map and delineate key population sites
Population size	Approximately 500–600 individuals	Population persistence within a spatially restricted area	Establish permanent survey routes and standardized counting protocols
Livestock pressure	Grazing and trampling	Potential damage to shoots, seed production, and juvenile individuals	Reduce grazing pressure during flowering and fruiting
Land disturbance	Gravel extraction, ploughing, road development, and construction activities	Loss of individuals and habitat fragmentation	Restrict excavation activities within occupied habitats
Climatic stress	Seasonal drought and variable precipitation	Potential limitations on natural regeneration	Regularly monitor precipitation and juvenile plant abundance

Conservation priorities. The first priority is to accurately delineate the sites occupied by the species and establish practical buffer zones around them on detailed field maps. This information should be communicated to local land users and relevant district authorities. New gravel extraction, land ploughing, and permanent construction activities should be prohibited within the designated sites. This represents a feasible, site-specific conservation measure that does not require the immediate establishment of a large protected area but instead focuses on safeguarding known habitats.

The second priority involves the seasonal management of livestock grazing pressure. A complete prohibition of grazing across the entire landscape is not necessary; however, livestock concentration and repeated trampling should be minimized in areas supporting reproductive individuals, particularly during flowering, fruiting, and seed dispersal. The installation of temporary information signs and awareness-raising activities involving local livestock herders could substantially reduce unintentional damage.

The third priority is to develop a standardized annual monitoring protocol that maintains consistent GPS-recorded survey routes, observation periods, and population counting categories. Where individuals can be reliably distinguished under field conditions, juvenile, vegetative, and reproductive plants should be counted separately. Permanent photographic monitoring points and systematic records of habitat disturbances would facilitate more objective comparisons across successive years. A substantial decline in the number of individuals, local disappearance of the species from previously occupied sites, or expansion of excavation areas should trigger additional field assessments outside the regular monitoring schedule.

The fourth priority is to collect seeds in quantities that do not compromise natural regeneration and to establish a properly documented ex situ seed reserve. Seed germination studies and seedling propagation experiments could support conservation activities and facilitate further investigations into the species' valuable biological characteristics. Monitoring data should be supplemented with herbarium

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specimens, georeferenced photographs, and taxonomically verified occurrence records. This would enable historical records published under the name Scorzonera tau-saghyz to be reconciled with the currently accepted taxonomy.

Key monitoring indicators. Future surveys should document not only the total population size but also its demographic structure. For this purpose, juvenile, vegetative, and reproductive individuals should be counted separately, while the proportion of flowering plants and the presence of newly emerged seedlings should also be recorded. Repeated counts conducted at comparable phenological stages would help distinguish natural seasonal variation from genuine population decline. The resulting data should be systematically compiled along permanent GPS-referenced survey routes and monitoring points.

Habitat monitoring should consistently document the boundaries of occupied sites, areas affected by trampling or ploughing, evidence of recent excavation, livestock density, and road construction activities using standardized recording protocols. Photographs taken from identical fixed monitoring points during each field visit would enable visual comparisons of habitat changes over time. Once these indicators have been collected over several consecutive years, it will be possible to quantitatively assess population dynamics and the intensity of threats, thereby providing a stronger scientific basis for evaluating the species' conservation status against internationally recognized criteria.

Conclusion. Repeated field surveys conducted between 2023 and 2026 provided an estimated population size of approximately 500–600 individuals of Takhtajaniantha tau-saghyz within the surveyed sites of the Arbag‘ish foothills, at elevations ranging from 1,080 to 1,230 m above sea level. The presence of the species was confirmed during all four field seasons; however, the available data do not support definitive conclusions regarding interannual changes in population abundance.

Nevertheless, the species' restricted spatial distribution, combined with livestock grazing pressure, gravel extraction, land conversion, road construction activities, and climatic stress, makes this population a priority for conservation at the local level. Habitat delineation, restrictions on soil-disturbing activities, seasonal management of livestock grazing pressure, standardized annual monitoring, and the establishment of an ex situ seed reserve represent practical and feasible conservation measures.

The findings of this study provide preliminary baseline information for this specific locality. Before proposing a formal conservation threat category, these data should be supplemented by long-term investigations into population demography, reproductive status, and habitat quality.

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