Journal of Natural Science Review

Vol. 2, No. 3, 2024, 17-28
https://kujnsr.com
e-ISSN: 3006-7804

Baseline Survey of Plant Species Along Salang Road in Afghanistan

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ABSTRACT

The Salang Road, a critical transportation corridor, serves as a vital link connecting the northern and southern parts of Afghanistan. In response to the government's decision to upgrade this road, assessing and documenting the plant species in the region is crucial. This study was conducted to catalog the plant species along the Salang Road, aiming to establish a comprehensive understanding of the area's botanical diversity. Plants were recorded using the quadrate sampling method at 35 sampling points. A transect line was set up at each sampling point, 5 quadrats were established along each line, and the occurrence of plants within the quadrat frame was recorded. Quadrat sizes, determined using the minimal area method, were 10×10 m for trees, 2×5 m for shrubs, and 1 m^2 for herbs. Plants were identified with the help of literature and by comparing with the deposited specimen of Kabul University Faculty of Sciences Herbarium (KUFS). Data were analyzed using Microsoft Excel. 135 diverse species, including trees, shrubs, and herbs, representing various ecological niches were documented. These species belong to 46 plant families, and the most abundant ones were Asteraceae, Apiaceae, Rosaceae, Lamiaceae, Fabaceae, and Polygonaceae. The survey additionally examined road construction's impact on plant species' distribution and diversity. The survey provides valuable insights into the Salang corridor area's botanical diversity and ecological significance, serving as a foundational dataset for future environmental conservation and land management efforts. The information obtained from this study can support qualified decision-making and sustainable development practices in the region.

ARTICLE INFO

Article history:

Received: July 25, 2024
Revised: September 7, 2024
Accepted: September 13. 2024

Keywords:

Salang Road; Baseline survey; Plant species; Botanical diversity; Environmental impact

To cite this article: Karimi, A. G., Fritsch, R. M., & Xian, C. L. (2024). Baseline Survey of Plant Species Along Salang Road in Afghanistan. *Journal of Natural Science Review, 2* (3), 17-28. DOI: https://doi.org/10.62810/jnsr.v2i3.86

To link to this article: https://kujnsr.com/JNSR/article/view/86

INTRODUCTION

Salang Corridor holds significant importance as a strategic mountain pass in Afghanistan, connecting the northern and southern parts of the country. It is a vital transportation route, traversing the Hindu Kush Mountain range and linking the provinces of the north of

Afghanistan to the capital, Kabul, and the southern regions (Woods, Karimi, Jafari, & Hinchliffe, 2022). The government of Afghanistan had decided to upgrade the road. Therefore, a floristic study, which involves identifying and analyzing plant species in this area, is vital for several reasons. It is a comprehensive way to understand the existing plant communities along the road before an upgrade, enabling environmentally conscious and sustainable development practices. This study helps assess the diversity of plant species in the area. This information is crucial for understanding the existing ecosystem and its components because road upgrades can have significant ecological impacts (Ashouri, 2023). The floristic study provides data on the current vegetation, allowing for an assessment of how the upgrade might affect local plant communities by disturbing or altering habitats and overall ecosystem balance. Some plant species may become rare, threatened, or endangered. A floristic study helps identify these species, allowing for appropriate measures to protect and conserve them during the road upgrade. Plants are integral components of wildlife habitats. Studying the flora helps indirectly to assess the potential impacts on local fauna. Plant community changes can affect food and shelter availability for various animal species. Certain plant species maintain soil stability (Ford et al., 2016).

A floristic study can identify plants that contribute to erosion control (Cerdà, et al., 2021), helping planners and engineers make well-based decisions on mitigating soil erosion risks associated with road upgrades. Knowledge of the currently present local flora is valuable for land-use planning. It can inform decisions on where to place infrastructure, how to design green spaces, and how to integrate the road upgrade into the existing landscape. Understanding the local flora can be important for engaging with local communities. People often have cultural and aesthetic connections to the plants in their area, and involving them in the decision-making process can lead to more sustainable and community-friendly road upgrades. Many environmental regulations require thorough assessments of the impact of development projects on local flora and fauna. The floristic study is a comprehensive way to understand the existing plant life before any upgrade and construction. Therefore, this floristic study was designed to identify plant species growing along the Salang Road between Jabal-al-Saraj and Khinjan and to assess the likely effects of road upgrade construction activities on these plant species.

METHODS AND MATERIALS

Study area

The study area is located between Parwan Province and Baghlan Province. It includes observations of flora alongside the road in a strip 200 m broad on both sides of the centerline at approximately 95 kilometers from Jabal al-Saraj to Khinjan Bridge. The area lies between 35° 00'-35° 40' North latitude and 68° 45'-69° 31' East longitude. The corridor crosses the Hindu Kush mountains through the Salang Tunnel at a height of about 3,400 m (and there is also the borderline of both provinces). Due to the tremendous geological and geomorphological diversity and the complex conditions of thermal and humidity climate, the

region is strongly influenced by diverse non-living factors (geodiversity). Therefore, the area has rich vegetation that covers many altitudinal zones, from low-altitude areas in Jabal al-Saraj to Kotel Salang. Certain plant populations in each of these zones are specifically adapted to the climatic and pedological conditions (soils) in the respective zones.

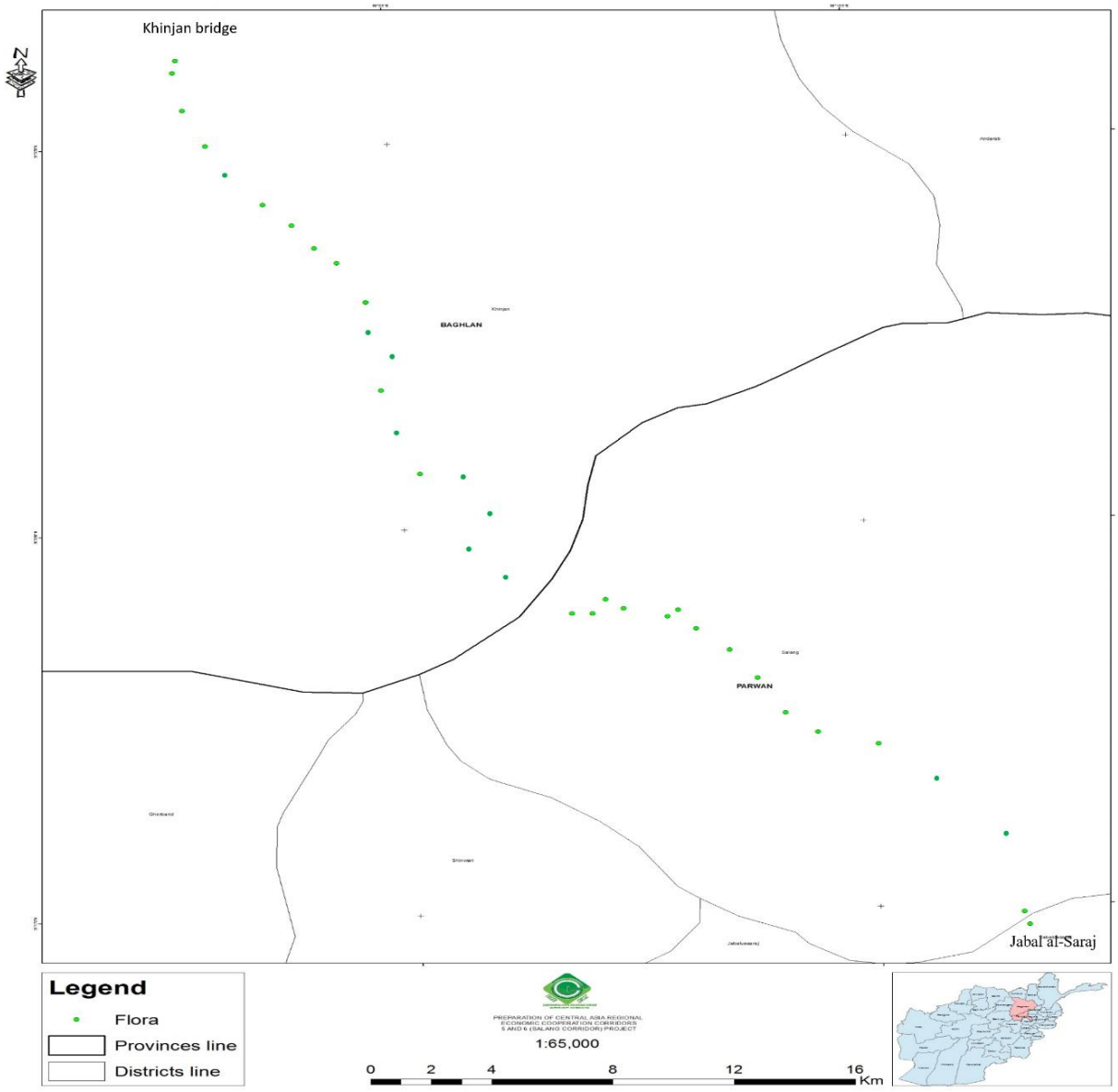

Figure 1. Map of the study area

The field study was conducted from October 1 to October 20, 2019. The quadrat sampling method was employed to evaluate the species distribution pattern and abundance. Sampling points were established at 100-meter elevation intervals along the road using Global Positioning System (GPS) technology, resulting in 35 points. Except for the first, a 100-meter transect line was set at each point, and five quadrats were sampled alternately along each transect. The quadrat sizes, determined using the minimal area method, were 10×10 meters for trees, 2×5 meters for shrubs, and 1 square meter for herbs (Rahman, et al., 2016).

Identification of Plant Species

The recorded plant species in our sampling sites were documented photographically. Most of the species were identified on-site by the first author. Plants unfamiliar to the author were compared with the deposited specimen of Kabul University Faculty of Sciences Herbarium (KUFS), or whether they matched the photographs in the Field Guide Afghanistan (Breckle & Rafiqpoor, 2010). For the identification of species, we also used the "Checklist of the Flowering Plants of Afghanistan" (Podlech, 2012), "Vascular Plants of Afghanistan" (Breckle, Hedge, & Rafiqpoor, 2013), and "Trees and Shrubs of Afghanistan" (Alam, 2012). Doubtful determinations were verified by specialized botanists using photographs. Collected herbarium specimens were housed in the Kabul University Faculty of Pharmacy Herbarium.

FINDINGS AND DISCUSSION

In this study, a total of 135 plant species belonging to 46 different families were recorded. Table 1 provides detailed information, including these species' local names and life forms. The presence of 135 plant species in a narrow area indicates considerable plant diversity in the study area. The high diversity of plant species will be due to the fertility and humidity of the area as well as the result of topographic and physiographic conditions (Ravanbakhsh & Amini, 2014).

Table 1. Plant species observed along the Salang Road (H - herbs, M - Mushroom, S - shrubs, T - trees

Family	Scientific name	Local name	Life form
Amaranthaceae	Amaranthus chlorostachys Willd.	Chawlaei	H
Amaranthaceae	Amaranthus retroflexus L.	Taji Khrus	H
Amaranthaceae	Bassia scoparia (L.) A.J.Scott	Surkhak Jaru	H
Apiaceae	Ferula diversivittata Regel & Schmalh.	Kamal	H
Apiaceae	Heracleum lehmannianum Bunge	Sufei	H
Apiaceae	Carum carvi L.	Zireh	H
Apiaceae	Daucus Carota L.	Zardak	H
Apiaceae	Ferula sp. (not further identified)	Barbu	H
Apiaceae	Not further identified	Suzie	H
Apiaceae	Levisticum officinale W.D.J. Koch.	Sarpaji	H
Apiaceae	Ferula assa-foetida L.	Hing	H
Apiaceae	Foeniculum vulgare Mill.	Badiyan	H
Apiaceae	Trachyspermum ammi (L.) Sprague	Javani	H
Apiaceae	Ferula szowitsiana DC.	Buragak	H
Apiaceae	Prangos pabularia Lindl.	Ghighu	H
Apiaceae	Pastinaca sativa L.	Shaqaqil	H
Apiaceae	Eryngium caeruleum M.Bieb.	Kharkharak	H
Araceae	Acorus calamus L.	Qarsiq	H
Asclepiadaceae	Cynanchum sibiricum Wall.		H
Asphodelaceae	Eremurus stenophyllous (Boiss. & Buhse) Baker	Seich	H
Asteraceae	Cousinia sp.	Laruk	H
Asteraceae	Centaurea depressa L.	Guligandum	H

Asteraceae	Tripleurospermum disciforme (C.A.Mey.) Sch.Bip.	Sozanki Gawi	H
Asteraceae	Cichorium intybus L.	Kasni	H
Asteraceae	Achillea wilhelmsii K. Koch	Zardsarak	H
Asteraceae	Centaurea virgata Lam.	Rindak Jaru	H
Asteraceae	Helianthus annuus L.	Guli Aaftabparast	H
Asteraceae	Arctium umbrosum (Bunge) Kuntze	Palani Kharak	H
Asteraceae	Cirsium vulgare (Savi) Ten.	Yakhni Khar	H
Asteraceae	Taraxacum officinale F.H. Wigg.	Taraxacumid	H
Asteraceae	Artemisia scoparia Waldst. & Kit.	Jaru buta	H
Asteraceae	Artemisia sp.	Drawneh	H
Asteraceae	Echinops nanus Bunge	Nalin Kharak	H
Asteraceae	Lactuca orientalis (Boiss.) Boiss.	Qauq	H
Asteraceae	Chondrilla yossii Kitam.		H
Asteraceae	Cousinia blepharobasis Rech. f. & Gilli	Shashak Khar	H
Asteraceae	Xanthium strumarium L.	Gusfandkharak	H
Berberidaceae	Berberis integerrima Bunge	Zirk	S
Boraginaceae	Anchusa azurea Mill.	Guligawzuban	H
Boraginaceae	Trichodesma incanum (Bunge) A.DC.	Elmiti	H
Boraginaceae	Onosma dichroantha Boiss.	Subyan alaf	H
Boraginaceae	Microparacaryum bungei (Boiss.) Khat.		H
Brassicaceae	Brassica rapa L.	Sharsham	H
Caesalpiniaceae	Cercis griffithii Boiss.	Arghawan	T
Cannabaceae	Cannabis sativa L.	Chars	H
Capparaceae	Capparis spinosa L.	Kawar	S
Caryophyllaceae	Acanthophyllum grandiflorum Stocks	Shalangi	S
Polygonaceae	Polygonum podlechii Rech. f. & Schiman-Czeika	Durkak	S
Amaranthaceae	Anabasis macroptera Moq.		S
Cucurbitaceae	Cucurbita pepo L.	Kadu	H
Convolvulaceae	Convolvulus arvensis L.	Pichak	H
Elaeagnaceae	Hippophae rhamnoides L.	Syah Khar	S
Elaeagnaceae	Elaeagnus angustifolia L.	Sinjed	T
Ephedraceae	Ephedra gerardiana Wall. ex Klotzsch & Garcke	Jerakaneh	S
Equisetaceae	Equisetum arvense L.	Bandak Alaf	H
Euphorbiaceae	Euphorbia megalocarpa Rech. f.	Shier Choshak	H
Fabaceae	Trifolium pratense L.	Sehbargeh	H
Fabaceae	Vigna radiata (L.) R.Wilczek	Mash	H
Fabaceae	Medicago sativa L.	Rishqeh	H
Zygophyllaceae	Tribulus terrestris L.	Kharmughilan	H
Fabaceae	Astragalus koschukensis Bioss.	Giech	S
Fabaceae	Astragalus spp.		S
Fabaceae	Not further identified	Ghuzpacheh	S
Fabaceae	Alhagi pseudalhagi (M. Bieb.) Desv.	Jentaq	S
Fabaceae	Glycyrrhiza glabra L.	Sherin buieh	H
Fabaceae	Robinia pseudoacacia L.	Akasi	T
Fumariaceae	Fumaria indica (Hausskn.) Pugsley	Shatareh	H

Juglandaceae	Juglans regia L.	Charmaghz	T
Juncaceae	Juncus inflexus L.	Sabatak	H
Lamiaceae	Nepeta glutinosa Benth.	Hajdum	H
Lamiaceae	Marrubium anisodon K. Koch.	Gazak Alaf	H
Lamiaceae	Salvia rhytidea Benth.	Gadabaghal	H
Lamiaceae	Mentha longifolia (L.) L.	Pudineh	H
Lamiaceae	Ziziphora clinopodioides Lam.	Kakuti	H
Lamiaceae	Ziziphora tenuior L.	Kakuti	H
Lamiaceae	Phlomidoschema parviflorum Benth.	Paruleh	H
Lamiaceae	Nepeta subincisa Benth.	Pudinehi kohi	H
Lamiaceae	Nepeta juncea Benth.	Dorband	S
Lamiaceae	Phlomoides loasifolia (Benth.) Kamelin & Makhm.	Shirinchoshak	H
Lamiaceae	Phlomoides canescens (Regel) Adylov, Kamelin & Makhm.		H
Lamiaceae	Nepeta pamirensis Franch.		H
Lamiaceae	Origanum vulgare L.	Hazwol	H
Malvaceae	Malva neglecta Wallr.	Panirk	H
Malvaceae	Althaea officinalis L.	Guli Khatmi	H
Moraceae	Morus alba L.	Toot	T
Orchidaceae	Dactylorhiza incarnata subsp. cilicica (Klinge)H.Sund.	Salabmisri	H
Pinaceae	Cedrus deodara (Roxb. ex D.Don) G. Don	Archeh	T
Plantaginaceae	Plantago lanceolata L.	Shinaru	H
Plantaginaceae	Plantago major L.	Zouf	H
Platanaceae	Platanus orientalis L.	Panjeh Chinar	T
Pleurotaceae	Pleurotus eryngii (DC.) Quél.	Samaruq	M
Plumbaginaceae	Acantholimon erinaceum (Jaub. & Spach) Lincz.	Surkhghuzba	S
Poaceae	Bromus scoparius L.	Alf	H
Poaceae	Bromus pumilio (Trin.) P.M.Sm.	Alaf	H
Poaceae	Bromus danthoniae Trin. ex C.A.Mey.	Sabza	H
Poaceae	Oryza sativa L.	Brinj	H
Poaceae	Stipa caucasica Schmalh.	Kodeh	H
Polygonaceae	Rumex crispus L.	Shilkheh	H
Polygonaceae	Polygonum aviculare L.	Haftband	H
Polygonaceae	Koenigia coriaria (Grig.) T.M.Schust. & Reveal	Man	H
Polygonaceae	Persicaria hydropiper (L.) Delarbre	Murchi Abie	H
Polygonaceae	Rheum ribes L.	Chukri	H
Polygonaceae	Atraphaxis pyrifolia Bunge	Selbin	S
Primulaceae	Primula pamirica Fed.	Gulibinafsha	H
Ranunculaceae	Ranunculus olgae Regel	Shorwa gulak	H
Ranunculaceae	Adonis turkestanica (Korsh.) Adolf	Badboui	H
Rosaceae	Rubus caesius L.	Budergan	S
Rosaceae	Rosa beggeriana Schrenk ex Fisch. & C.A.Mey.	Tarani	S
Rosaceae	Rosa webbiana Wall. ex Royle		S
Rosaceae	Rosa sp. (not further identified)		S
Rosaceae	Filipendula vestita (Wall. ex G. Don) Maxim.	Daduf	H

Rosaceae	Malus domestica (Suckow) Borkh.	Saieb	T
Rosaceae	Crataegus songarica K. Koch.	Dulaneh	T
Rosaceae	Prunus amygdalus Batsch [var. amara]	Badami Kohi	T
Rosaceae	Prunus persica (L.) Batsch	Shaftalu	T
Rosaceae	Prunus cerasus L.	Alubalu	T
Rosaceae	Prunus domestica L.	Allou	T
Rosaceae	Prunus armeniaca L.	Zardalu	T
Rosaceae	Pyrus communis L.	Naak	T
Salicaceae	Salix alba L.	Khar bied	T
Salicaceae	Salix babylonica L.	Majnunbied	T
Salicaceae	Salix spp. (S. excelsa S.G.Gmel. incl. S. pycnostachya Andersson)	Bed, Pelchinbed	T
Salicaceae	Populus alba L.	Chinar	T
Scrophulariaceae	Verbascum thapsus L.	Gushi Kharak	H
Scrophulariaceae	Scrophularia oblongifolia Loisel.	Sabunak	H
Simaroubaceae	Ailanthus altissima (Mill.) Swingle	Beidi Rosi	T
Solanaceae	Datura stramonium L.	Datureh	H
Solanaceae	Hyoscyamus niger L.	Bangakdiwana	H
Solanaceae	Solanum villosum Mill.	Anguorsagak	H
Tamaricaceae	Tamarix ramosissima Ledeb.	Gaz	S
Unknown	Unknown	Ghuzpacheh	S
Unknown	Unknown	Guli Aahu	H
Urticaceae	Urtica dioica L.	Gazindeh	H
Vitaceae	Vitis vinifera L.	Anguor	S
Zygophyllaceae	Peganum harmala L.	Esfand	H

The area investigated contained shrubs, herbaceous species, and common or scattered single wild and cultivated trees. In the agricultural region and along creeks, *Mentha longifolia*, *Plantago lanceolata*, *Plantago major*, *Cichorium intybus*, *Urtica dioica*, *Ranunculus algae*, *Geranium* sp., *Primula pamirica*, *Juncus inflexus*, and several grasses were the dominant herbaceous species. In Salang Pass, shrubs and herbs like *Astragalus* spp., *Acantholimon* spp., and *Rosa* spp. *Artemisia* spp. *Phlomis* spp. and *Stipa caucasica* dominated. On both sides of the lower parts of South Salang, wild trees of almond (*Prunus amygdalus*) and Pinaceae trees (like *Cedrus deodara* in the northern part of Salang corridor in the non-cultivated areas) dominate the landscape in a forest-like manner. Also, in the upper parts of South Salang, around 4 kilometers along the road, willow species (*Salix alba*, *Salix spp.*) and *Populus alba* are cultivated as semi-forest in the influenced area. Fortunately, the wild Pinaceae trees in the northern part of Salang between Doushakh and Takhteh Sang and *Prunus amygdalus* spp. in the lower part of southern Salang are mainly growing far from the project area.

In contrast, fruit trees such as mulberry (*Morus alba*), cherry (*Prunus avium*), walnut (*Juglans regia*), peach (*Prunus persica*), and apricot (*Prunus amygdalus*) are located on both sides of the road as cultivated trees which are in the project area of influence. To protect fruit trees, the route of the new road should be diverted to minimize the removal of trees. The species recorded in the study area are not considered critical elements, threatened or endangered by the National Environmental Protection Agency of Afghanistan Protected List

(NEPA, 2010). However, many of these species possess economic and medicinal value (the percentage of medicinal species is about 57%). The most important medicinal economic species in the study area are Ferula spp. and Glycyrrhiza glabra, which can economically be exploited and are the main export items in the country (Babury & Keusgen, 2019). Species such as *Adonis turkestanica* with cardiac glycosides and *Peganum harmala* with quinazoline derivative alkaloids are very toxic. *Fumaria officinalis* is widely utilized as a remedy for dermatological conditions in Afghanistan.

Additionally, it has been documented to possess analgesic, antioxidant, anticancer, antibacterial, antidiabetic, and aphrodisiac properties. Moreover, it is noted for its positive effects on biliary disorders and irritable bowel syndrome (Al-Snafi, 2020). *Urtica dioica* is used for urinary problems such as prostatic hyperplasia and as a diuretic for urinary lithiasis. *Artemisia* spp., *Achillea wilhelmsii*, *Foeniculum vulgare*, *Tripleurospermum disciformis*, and *Plantago* spp. are common home remedies for gastrointestinal disorders such as stomachache and peptic ulcer, as laxative, anthelmintic, and carminative properties. *Euphorbia megalocarpa* is a common purgative in the area (Karimi & Keusgen, 2022). *Origanum vulgare* is an essential herbaceous and aromatic medicinal plant scattered on both sides of Salang Pass. It is the most varied species within the genus and is reported to be found across the Mediterranean region and in Western and Southwestern Eurasia. It has remarkable antimicrobial activities against multidrug-resistant bacterial and fungal pathogens (Soltani, Shakeri, Iranshahi, & and Boozari, 2021).

During this floristic survey, a total of 135 plant species comprising 93 herbs, 21 shrubs or semi-shrubs, 20 trees, and 1 mushroom were recorded (Fig. 2). This figure shows that herbaceous and shrubby species predominantly cover the area. It suggests that the area is their natural habitat. Therefore, the floristic study must be repeated during spring and early summer, providing an opportunity to make a reasonably complete assessment of the flora. This survey does not include ephemera and lower plants because most were no longer visible in October.

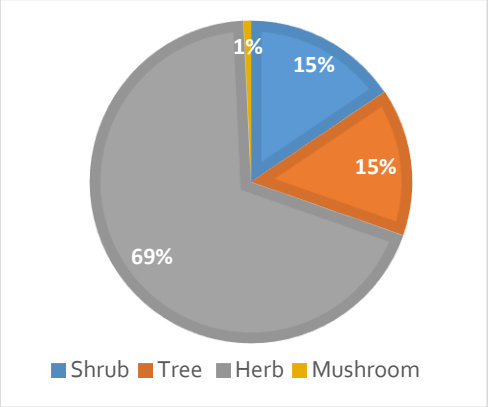

Figure 3. Statistics of plants life forms.

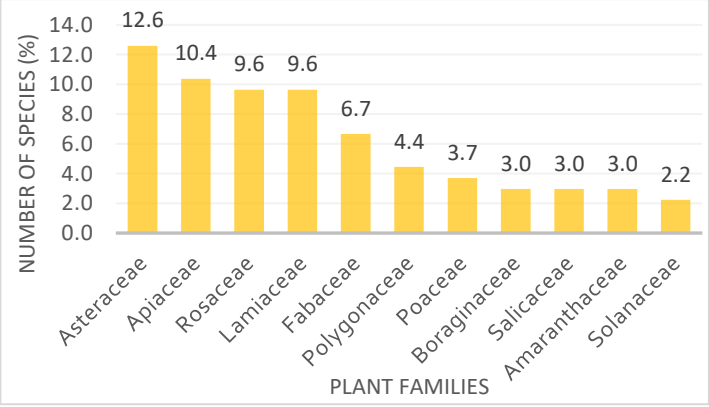

Figure 2. Statistics of plant families.

The documented species are distributed across 46 plant families, with the most frequent occurrences in Asteraceae, Apiaceae, Rosaceae, Lamiaceae, and Fabaceae and less frequent

occurrences in Polygonaceae, Poaceae, Boraginaceae, Salicaceae, Amaranthaceae, and Solanaceae (Fig. 3). This distribution reflects a significant level of biodiversity within the study area. This diversity mirrors the health, stability, and resilience of the ecosystem. Asteraceae, known as the daisy family, is one of the most prominent flowering plants, characterized by composite flowers made of many tiny flowers or florets. This family includes species like sunflowers, daisies, and asters. Apiaceae, commonly known as the carrot or parsley family, includes aromatic plants with hollow stems, such as carrots, celery, and dill. Rosaceae, or the rose family, includes fruit-bearing trees and shrubs like apples, pears, cherries, and roses. Lamiaceae, also known as the mint family, contains herbs like mint, basil, rosemary, and lavender, which are known for their aromatic qualities. Fabaceae, commonly called the legume, pea, or bean family, includes crops significant for human and animal consumption, like peas, beans, lentils, and peanuts.

Polygonaceae, the buckwheat family, includes plants like rhubarb and sorrel and the grain crop buckwheat. The Poaceae family, commonly known as the grass family, represents one of the most crucial plant families for human nutrition. It encompasses a variety of species, including wheat (*Triticum* spp.), maize (*Zea mays*), rice (*Oryza sativa*), and barley (*Hordeum vulgare*), which are foundational to global food security and agricultural systems. Boraginaceae, known as the borage family, includes ornamental plants and weeds. Salicaceae, the willow family, includes willows, poplars, and aspens, known for their wood and medicinal properties. Amaranthaceae includes amaranth and quinoa, as well as ornamental plants and weeds. Solanaceae, the nightshade family, includes important crops like tomatoes, potatoes, eggplants, peppers, and toxic plants like belladonna.

As mentioned above, the vegetation throughout most of the study area is dominated by herbaceous species accompanied by shrubs and some scattered trees. In the agricultural area, herbaceous species and fruit trees were also cultivated on both sides of the road for food. Woody species form small dispersed patches through the site, along the road, and the river. The project to upgrade the road will have short and long-term impacts on the terrestrial flora due to the location of the proposed road parts where gardens and forested patches currently reside. The main effect on the vegetation will be excavating soil and rocky ground to install the proposed upgraded road.

Nonetheless, it is expected that these impacts are temporary and that they will be mitigated by activities such as reforestation, restoration, creation, and conservation of habitats, all of which should be considered as part of the proposed project. Any removal of trees must comply with the regulations of the National Environmental Protection Agency (NEPA) and the Department of Forests of the Ministry of Agriculture of Afghanistan. It is recommended that nearby reforested areas be substituted for forested regions impacted by the Project to create an attractive area to re-establish species once the construction activities have ended. The project has to mitigate the loss of native trees even if the site does not have species that are considered a conservation priority. Because the area is regarded as a natural habitat with high ecological value, the project has to obey Afghanistan and international laws

regarding conserving vegetation and wildlife. It is essential to highlight that the destruction and sediment control plan and the earth movement permit must be presented to the NEPA and the Forest Department of the Ministry of Agriculture for their evaluation and approval before any earth movement takes place. Before earth movement activities start, the contractor in charge must select areas that will be used as staging areas and access roads and provide a protection plan for those near areas deemed as ecologically sensitive.

CONCLUSION

The findings of this study unequivocally demonstrate that the Salang corridor possesses a rich and diverse flora. This terrain is predominantly covered by herbaceous species, interspersed with scattered trees and shrubs. The survey of higher plants is seasonal. It is not always possible to record all species in the study area. This survey does not include all herbaceous and lower plants because most have already died and have been removed from the regions. The area hosts numerous plants of medicinal and economic significance. Notably, no species within the study area have been classified as critical, threatened, or endangered by the National Environmental Protection Agency (NEPA).

The flora within the project area may experience short-term impacts due to the planned activities. However, adherence to environmental protection regulations and laws and implementing the recommended mitigation measures are expected to minimize these impacts and facilitate the recovery of the affected species.

Proactive and meticulous planning is essential to ensure that significant wildlife habitats are preserved and any potential adverse effects on plant cover are minimized or effectively remediated. Therefore, it is strongly recommended that the project complies with International Environmental Policies and Laws to safeguard the environment and the flora indigenous to the Salang area.

This compliance will not only mitigate the environmental impacts but also promote the sustainable recovery and conservation of the botanical diversity in the region, ensuring the long-term ecological health and stability of the Salang corridor.

Acknowledgments

This research forms part of the "Preparation of Central Asia Regional Economic Cooperation Corridors 5 and 6 (Salang Corridor) Project," funded by the former government of Afghanistan. The Green Circle Environmental Consultancy Services Company (GCECSC) was responsible for conducting a terrestrial flora and fauna study along the current Salang Road. The authors express their gratitude to GCECSC for their technical support and provision of accommodation during the field study. We acknowledge Prof. Breckle and Dr. Fritsch for their assistance in botanical identification. We also extend our appreciation to Mr. Behrouz and Mr. Zubair for their contributions to the fieldwork and to the officials at the district levels within the study area.

Conflict of Interest

The author declares that they have no conflicts of interest to disclose.

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