AJUGA TURKESTANICA (REGEL) BRIG. IN UZBEKISTAN BIOMORPHOLOGICAL CHARACTERISTICS, AREA, PLACE IN PLANT COMMUNITIES AND RAW RESOURCES

A.E. Egamberdiev
Acad. S.Yu. Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences of the Republic of Uzbekistan

https://doi.org/10.5281/zenodo.8359630

Abstract. *In the article, Ajuga turkestanica (Regel) Briq the biomorphological properties of the area, and its role in resource and plant communities have been cited by the results of a scientific study on the areas of modern distribution and raw material reserves. A. turkestanica the modern distribution map was created using the ArcMap 10.8.1 GIS package software when processing geoinform and vector data and constructing species distribution maps. A. turkestanica area divided its growing areas into 3 categories and 21 arrays. Category I consists of 6 massives, which are 800-1200 m above sea level, where plants grow thick, and it is easy to carry raw materials by transport, we introduced the gods close to populated villages. Category II consisted of 10 massifs, which were taken from areas 1200-1800 m above sea level, where plants were not very thick or plants grew thick, where transport could not come close to more than 2-3 km, away from the population. Category III consisted of 5 massifs, which were taken from areas 1800-2500 m above sea level, with less vegetation, and no road to transport. When raw materials are made from such fields, bringing them with the help of live forces will be necessary. In Uzbekistan the current biological reserve of A. turkestanica is 93.5±35.3 t, the usable reserve is 46.2±13.8 t, and the reserve to be prepared in 1 year is 28.4±5.42 tons.*

Keywords: a*juga turkestanica*; *formation; seed productivity; ontogeny; subdominant; annual.*

Introduction. There are about 4.500 plant species in the flora of Uzbekistan, 650 of which have essential oil and more than 1.000 species are medicinal (1). More than 50 types of these plants are the main raw materials in various branches of the national economy, especially in the food industry and medicine. Vitamins, alkaloids, terpenoids, glycosides, and several other chemical compounds necessary for human health will retain their properties. In recent years, the structure and properties of chemical compounds contained in many medicinal plants have been studied, and their biologically active substances have been introduced into scientific medicine (1-5).

Ajuga turkestanica (Regel) Brig. is a phytoecdysteroid-containing plant. Phytoecdysteroids are physiologically active substances with a wide range of effects. They have a positive effect on the human body with antioxidant, anabolic, hypoglycemic, and hemorrhagic effects, in the rapid healing of wounds, myocarditis, atherosclerosis, anti-cancer, bone fracture, and hepatitis treatment. Phytoecdysteroids are the basis of preparations such as Ecdisten, Ecsumid, Cytodyne, and Ecdybol, which have an anabolic, adaptogenic, and stimulating effect (6-12).

At present, these preparations are being prepared at the experimental industrial base of the institute (13-15). The plant contains phytoecdysteroids, iridoids, glycosides, flavonoids, and essential oil. Tincture and decoction of crushed stems and leaves of the plant are used in the treatment of malaria, cancer, atherosclerosis, diabetes, and myocardial diseases. Currently, it is

also used as a raw material for the perfume industry, as well as to restore physical impotence (16-29). The main goal of creating a map of the distribution of the plant *A. turkestanica* (Regel) Brig. is to determine and map its current distribution to study the natural resources and use more of our natural flora resources in medicine. This way, it is not only possible to use all its reserves but also to determine its biological properties, stage of development giving the best content of BAS, its place in the composition of plant communities under natural conditions, the degree of emergence under the influence of anthropogenic factors and the protection committees of plant communities in need of protection.

Materials and Methods. *A. turkestanica* (Regel) Brig. is an endemic plant, a representative of the family of *Lamiaceae.* It is an undersized shrub with a height of 30-40 cm and a strong root. *A. turkestanica* (Regel) Brig. stem erects or ascending, sometimes with a creeping stem. The leaf is entire, three-lobed, and even three-lobed. Flowers are sessile, false ring-shaped, many-flowered panicles located in leaf axils. Corolla inverted ovate, five-toothed. The corolla dries up at the time of fruiting but does not swell. Corolla leaves are jointed with a wide base, multi-veined, reddish in color, and 2-3 cm long. There are four lateral stamens and two anterior that are longer than the laterals, and the rest stamens are reduced. The fruit is one-seeded with four nutlets of 8-8.5 mm long, 3-3.5 mm wide, greenish-brown seeds, 1000 seeds weigh up to 20.2 grams. The seed is without endosperm, the spine is straight. At the base of the corolla, there is a circle. The plant is pollinated by insects and various other ways. It blooms and bears fruit in April-May. Therefore, during the years 2017-2021, studies on the *A. turkestanica* were conducted in the southern regions of Uzbekistan, Kashkadarya, and Surkhandarya (6).

It is of great importance to study the morphological characteristics of plant organs during the stages of ontogenesis. In the period of ontogeny, the growth of organs and the organism occur, and certain biochemical, physiological, and morphological processes are observed. During the development of individuals, all ontogenetic and age-related changes occur, such as substance and energy metabolism, cystogenesis and organogenesis, strong growth and division, recovery and reproduction, and aging and rejuvenation.

The natural development of the plant, floristic and phenological observations were carried out according to the method of Beideman I.V. (30). Method of Rabotnov T.A. (31, 32) used to determine fertilization of seeds in laboratory and field conditions. To determine the germination of plant seeds in laboratory conditions, 100 seeds of the plant were collected on printed paper moistened with distilled water in a Petri dish. Freshly harvested seeds and ones stored for different periods after harvesting were used to determine the seed germination in laboratory conditions, and 4 times were germinated at 5-300C. In studying the germination of seeds under field conditions, the germination rate, optimal planting time, and planting depth were determined by planting *A. turkestanica* 4 times out of 100 replicates. The method of Lishchuk S.S. (33) was used to determine the weight of 100 seeds.

A. turkestanica (Regel) Brig. is widely distributed on different slopes of the mountain slope, especially on the southeastern slopes, in gravel, gypsum, turf, typical gray soils, and olagins deposits, and in the creation of the distribution map, all the requirements, working stages of other thematic methods were followed, and the map was created in the ArcMap 10.8.1 GIS program.
The Maltsev I.I. (34-36) method is the most suitable for determining *A. turkestanica* (Regel) Brig. raw material reserves, taking into account the fact that it grows in the upper reaches of mountain rivers and meets at different heights. Walking diagonally across common areas, ten 20 m^2 squares

were counted separately for the age of plants and bushes suitable for raw materials. The total phytomass for the area was obtained by multiplying the obtained numbers by the average dry weight of one plant.

Results and Discussion**.** The ontogeny of the *A. turkestanica* was divided into 3 periods and 9 growth stages. I-latent period (seed), II-virginal period (grass, young, immature and virginal, young vegetative plants), III-generative period (early flowering, middle-aged and older plants). We divided the growth and development of the studied plant into latent, virginal, and generative periods. The virginal period, in turn, is divided into three stages: grass, juvenile, and immature.

Latent period. This period includes the time from seed ripening to germination. The seeds of *A. turkestanica* ripen in early July. The fruit is a one-seeded four nut-shaped, dry-opening, bean-shaped (kidney-shaped), covered with 20-30 toothed hairs. In the seed, the endosperm is not developed, and the germ is located correctly. Seed viability is preserved for up to 5 years. Germination of seeds depends on cold stratification and light. Information on seed germination is not provided in the literature. We conducted experiments in laboratory conditions during the years 2018-2021 to determine the seed maturation period and the germination of seeds stored at different temperatures. As shown in the table, seeds stored in laboratory conditions (20-22°C) for 1 year have the maximum fertility (71.3%), and after 5 years this indicator is known to decrease by three times (21,2%). This result shows that the fertility of seeds decreases when they are stored for a long time (Table 1).

Table 1. Temperature effect of storage on the germination of A. turkestanica seeds in laboratory conditions.

Temperature in 2018-2021	Storage, years					
	0.5	1	2	3	4	5
20-22°C	35.6±1.6	71.3±3.1	52.6±3.4	45.1±1.8	31.3±3.4	21.2±2.7

Newly harvested seeds in the laboratory and field conditions during 2018-2020 were 67.7 ±1.7 and 33.4 ±3.2. (Table 2).

Table 2. Fertility of newly bred seeds of A. turkestanica in the laboratory and field conditions, % (2018 -2020 years)

Treatment conditions	Germination, %			Average
	2018 y	2019 y	2020 y	
Laboratory conditions	68.5±1.5	66.2±1.7	67.5±1.9	67.4±1.7
Field conditions	30.3±3.9	35.5±2.5	34.3±3.3	33.4±3.2

The optimal for seed germination was 20-22°C, and germination was 58.8 ±3.3%. (Table 3).

Table 3. Fertility of Ajuga turkestanica seeds at different temperatures and germination energy,%

Indicators	Air temperature, ºC				
	4-5°C	13-14°C	20-22°C	24-26°C	30°C
Germination	20.8±3.2	36.7±2.9	58.8±3.3	50.6±4.2	34.9±3.4
Germination energy	3.2±0.6	5.2±0.8	7.7±1.1	6.6±1.2	5.4±0.6

Thus, the germination rate is high at a temperature of 20-22°C. This feature of *A. turkestanica* seeds decreases during the year but is not completely lost, and it is considered suitable for germination next year.

Virginal period. **1. *The grass.*** On 25.02.2018, 65.0-% of the seeds planted in autumn (October 2, 2017) in the experimental field of the Baysun district germinated 65.0%. Germination is above-ground, that is, epigeal, and the leaves of the plant growing above the ground. The leaves are narrowly lanceolate, 0.5 cm long, and 1.2 mm wide at the age of 10 days. In the plant, the duration of growth was 8-12 days.

2. Juvenile pressure. In the middle of March (12.03.2018), a true leaf is formed, and the height of the plant was 1.2 cm. After a few days, the growth of the plant accelerated, the height of the plant was 2,9 cm, and the width was 2,6 mm. In the second ten days of March, the height of the plant reached 5 cm, the number of leaves reached 6, and their size was 0.4 - 0.5 cm. In this case, the root depth reached 9 cm. By the end of March (25.03.), the growth of the plant becomes active as the air temperature rises. It was observed that the height of the plant is 9-10 cm, the number of leaves reaches 6-7, and their length is 0,7 cm and width is 0.4 cm. At this time, the thinnest branch was 0,4 cm long, and the leaf band was 0,2-0,3 cm long. By the end of March (30.03.), the height of the plant was 11-12 cm, the number of leaves reached 8, and their size was 0,9 cm, width 0,5 cm. Thus, in the juvenile state of *A. turkestanica*, up to 8 leaves were formed on the stem, and this stage of the development of seedlings lasted 15-20 days.

3. Immature head in the first ten days of April (5.04), the height of the plant reached 13 cm. The number of leaves reached 9, and their length was 0.6-0.7 cm. In this case, the root depth reaches 22 cm. By the middle of April (15.04.), the growth of branches becomes active as the air temperature rises. Plant height It was observed that 19-20 cm, the number of leaves reaches 9-11, the length is 0,9 cm and the width is 0,4 cm. By the end of April (30.04.) the height of the plant is 21-25 cm. The number of leaves reaches 14 and their length is 1,1 cm and width are 0,5 cm. This stage of development of *A. turkestanica* cases lasts 25-27 days. Based on the observations, the plant in the third year entered the generative period on April 25, 2020. By this time, its height was 39-42 cm, the number of stems was 3-4, the number of leaves was 23-31, and the depth of the root was 75-82 cm.

Generative period. Information on *A. turkestanica* generative period, flowering, and fruiting is not available in the literature. The results of our observations showed that the plant entered the generative period in the third year of its vegetation. This coincides with the beginning of May when flower buds appear from the axils of the leaves from the third joint to the 9-10 joint of the main stem. At the end of May, single buds in the axils of 8-9 pairs of leaves begin to open. During this period, the height of a 3-year-old plant reaches an average of 24-26 cm, and the growth of the plant slows down. The opening of flowers of *A. turkestanica* mainly lasts from the end of April to the end of May. The flower opens as follows: the buds that should open the next day differ in size and weight compared to others. The corolla leaves are higher than the corolla leaves, and the next day the buds begin to open as they mature. Corolla leaves are jointed with a broad base, multi-veined, reddish in color, and 2-3 cm long. During the opening of the flower, the pollinators are tightly attached to the pistil, 5 hours after the opening of the flower, the pollinators move away from the pistil towards the petals, leaving the remains of the pollinator sealed in the form of pollen grains around the tip. The pods of seed pods are head-shaped and hairy at the top. 1 day after the opening of the flower, the beak parts begin to separate from the middle part, and by the 3rd day, the beak parts are completely separated and remain separate will remain under the muzzle. At this time, the corolla darkens and begins to shrivel. By the 5th day, the beak changes from red to pinkish-red, on the 6th day, the rind dries up on the beak, and the fruit is formed. So, it takes 6

days for the bud to fully open and the petals to spill out. Some parts of the mature pollen grains, that is, the places where the pollen nests stick together, are covered with a thick cuticle. As a result of the tests, it was found that there are a large number of pollen grains in 9 mm long buds, the length of the pollen grain is 4 mm, and the length of the pollinator thread is 1 mm. During the period before the bud matures and the flower opens, the anther grows imperceptibly, its length reaches 4,4 mm, and it is considered to be another at this time. In the generative period, the tap root of the plant reaches up to 80 cm, and its branches up to the 4th order. The base of the root is strongly woody. At the end of the first year of vegetation, 7-8 joints are formed on the branch. In the second and subsequent vegetation years, annual shoots begin to grow from 2-3 pairs of buds in the joints of the main part of the surviving stem of the previous year, these branches do not branch. In the second year of vegetation, the branches grow monopodial i.e., the tip bud is open, the plant root grows strongly up to 50 cm, lateral roots of the 4th order begin to appear from the main root, the lateral root of the 2 nd order develops strongly and grows parallel to the main root. The third year of vegetation of *A. turkestanica* falls at the beginning of March. In this case, annual shoots grow from 3-4 pairs of buds on each plant, and their growth continues from mid-march to the end of April. At this time, the height of the annual branch reaches 24 cm, and 6 pairs of leaves appear. 4-5 pairs of leaves are 3,4-3,7 cm long and 1-1,2 cm wide. At this time, a branch of the second order is formed in the axil of the leaves at the 2-3 joints and starts to grow together with the branch of the first order. From the end of April to the middle of May, the growth and development of the plant slow down.

Flowering biology of Ajuga turkestanica. It is very important to study the reproductive biology of medicinal plants, to reproduce them, to determine their raw materials, to cultivate wild species, and to determine the laws of adaptation to living conditions. Reproductive biology - studies the laws of plant reproduction. Among the scientists who developed this line of science; O.A. Ashurmatov, Kh.Ch. Boriev, J.Yu. Tursunov, Kh.Q. Karshiboev (37-39) and other scientists explained the laws of reproductive biology in their works. *Turkestanica* belongs to the category of day thermophilic plants. Flowers begin to open in open weather, at a temperature of 20°C, from 8-9 in the morning. Flowers were observed to open from 8:00 am to 5:00 pm in the Baysun district experimental field. Its flowering rhythm has changed a lot due to air temperature (35°C) and other factors of the external environment. So, it was observed that the total flowering period of this plant lasted 44-46 days from the middle of April (15.04) to the end of May (30.05). In order to determine the daily flowering period of this plant, 10 plants were selected and observed from 6 am to midnight. The number of opened flowers in each bush was counted and then cut off. At the same time, air temperature (30-35°C) and humidity (55%), and sunlight (80.000 lux) were calculated (Figure 1).

Root productivity of Ajuga turkestanica. The most important biological characteristics of plant seeds are formation, the structure of seeds, and physiological processes occurring in them. The life of each individual begins with the germination of a seed and ends with the formation of a seed. In this process, the complete transition or non-transition of plant phases is compared and analyzed depending on the ecological factors of the place where it is grown, and the naturalness of the indicators is shown. As a result of many years of research, the number of generative and vegetative stems in *A. turkestanica* has changed depending on their growth in different environmental conditions. seed yield studies were conducted during 2018-2020. Up to 65 branches

were formed on each bush of *A. turkestanica* growing under natural conditions in the Kashkadarya and Surkhandarya regions. Each plant produced up to 72 flowers.

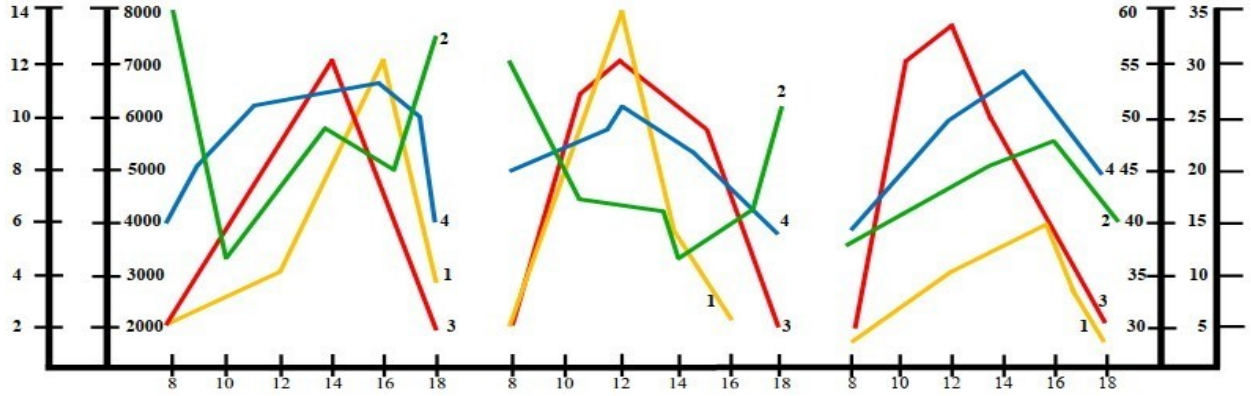

Figure 1. Diurnal flowering of the Ajuga turkistanica (n -3)

1. _____number of open flowers
2. _____relative humidity
3. _____natural sunlight W /m ^{2} FAR
4. _____temperature

Due to the very warm weather in 2018, the flowering of plants started much earlier (15.04). In 2019, the flowering period was observed later (18.05) due to good weather and prolonged rainfall. 2020, when the phenology of *A. turkestanica* was observed in the experimental field of the Baysun district, the plant began to bloom on April 29. The period of fruiting lasted longer than flowering, depending on weather conditions.

We studied fruit sets based on the beginning of the flowering process, total flowering, completion, and location of the flowers on the stem (bottom, middle, and top). The highest number of opened flowers and set fruits was observed during the beginning of flowering and the period of total flowering. At the beginning of the flowering period, an average of 72.7 flowers were formed on one stem per plant. In the experimental field of the Baysun district, it was observed that the fruit yield was high for three years. But, due to the change of weather, some of the buds did not have time to form flowers. At the end of flowering, the buds and flowers formed are relatively small, and only 50-55% of the seeds of the fruit are fully ripened (40) (Table 4).

Table 4. Productivity of Ajuga turkestanica (under natural conditions)

Geographical location (soil type, the sea from sath height, h)	Years observed	One the number of generative organs on the stem			Find 1seed productivity piece
		buds	flowers	fruits	
Baysun district, yellow and brown soil, h-800	2018	73,1 ±4,95	62,0±3,55	48,0±2,05	65,6
	2019	71,4±5,40	65,8±3,29	51,2±3,01	71,7
	2020	73,8±5,24	60,1 ±2,01	54,4±2,04	73,7
Average	3 years	72,7±5,19	62,6±2,95	51,2±2,36	70,4

Area of *Ajuga turkestanica (*Regel) Brig. *A. turkestanica* (Regel) Brig. a map of distribution (according to productivity scores) in Mochaydarya, Sheroboddarya, Pulkhakim, Kattaoradaryo, Kichikoradaryo, Egrisuv, Aksuvdarya and Kyzildarya riverbeds of Kashkadarya and

Surkhandarya regions was drawn up, in which 3 categories and 32 massifs were highlighted on the map Fig. 2.

As shown on the map, *A. turkestanica* (Regel) Brig. upper Darband, lower Darband, Pasurkhi, Cholbair, Sayrob, Sisanga, Charvok, Gaza, Dugoba, Turkkisloq, Beliboyli, Aqqishloq, Yonakishloq, Kachaksoy, Murgakkisloq, Kattakishloq, Chashmiron, Tashkurgan, Jiydalisoy, Laylik, Boykurgan, Shorguzar, Bozortepa, Pachkamar, Langar is widely distributed around the villages of Ota, Qizilkisloq, Okdaghana, Kataltoy, Chit, Dashtigaz, Inqabad, Koshbulok, Fangart, and each village is marked with special symbols on the map, map 2 (40-46).

Thus, the current distribution limit of *A. turkestanica* (Regel) Brig. in Central Asia starts from the north in the upper part of Kattaoradaryo, Aksuvdarya, Kyzildarya riverbeds of Kamashi district of Kashkadarya region (around Maidanak observatory road) and ends in the vicinity of the village of Obimozor in Dushanbe region of the Republic of Tajikistan in the north-west. It was found that it was spread around the south-western part of the Republic of Turkmenistan from the Kohitang mountain, from the east to the village of Vakhshavor of the Denov district, from the south to the Baysun district, and from the west to some villages of the Sherabad district.

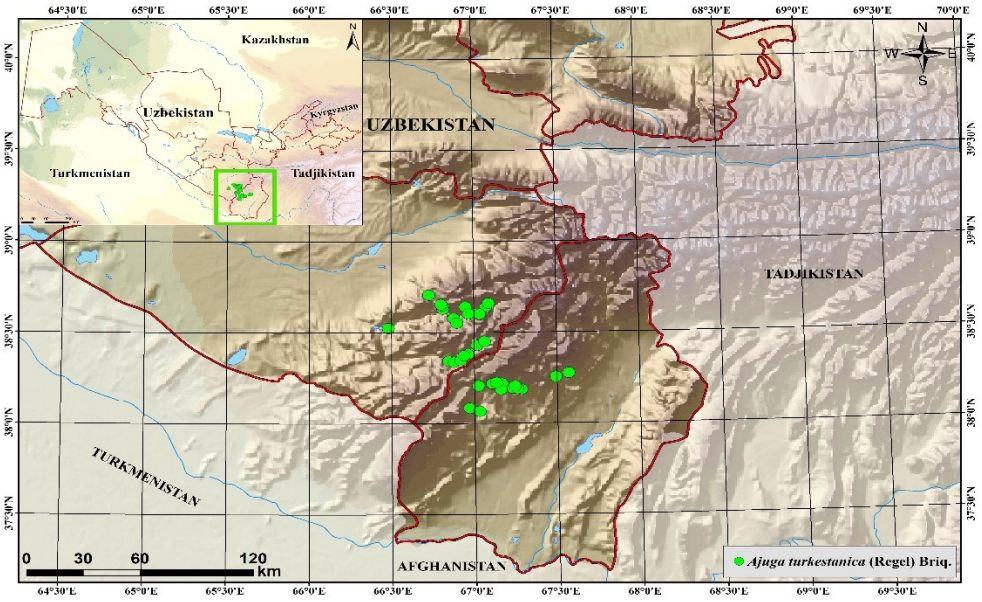

Figure 2. Distribution of Ajuga turkestanica (Regel) Brig. in Uzbekistan

The role of Ajuga turkestanica in vegetation cover. Ajugeta turkestanicae formation. In the studied area, this formation occupies an area of 1300 ha. They are mainly distributed in the areas from Jiydalisoy and upper Darband villages of Denov district to Sherabad district, around the villages of Sayrob, Pasurkhi, and Sho'rob, in gravelly, gypsum-rich, reddish oleaginous deposits at an altitude of 800-1300 m above sea level (N38°12'41.38"E66°58'43.95"). As a result of research, we found out that there are 4 new associations in this formation.

These consist of those in the q house:

Ajuga turkestanica (Regel) Briq, *Poa bulbosa* L., *Ehinops polyacantlius* Iljin, *Nardurus elegans* Schipcz., *Artemisia tenusecta* Nevski, *Ziziphora tenuior* L. association. This association is in 2019 It was founded and described on May 11 in the south of the village of Darband (N38°13'24.99"E67°7'14.13"). The soil is on the olivine deposits, with a slope of 12 to the south. Plants in association 22% of the total amount is to *A. turkestanica*, 5%-*R. bulbosa*, 3%-*E.*

polyacanthus is organized. The plants forming the association are classified according to their life forms shrubs -2, semi-shrubs -1, semi-shrubs -1, perennial grasses -12, biennial grasses -1, and annual grasses-9. The total area of the association is 1100 ha, and the yield level is 160 kg per hectare. The total number of plants in the association is 55 %.

Ajuga turkestanica (Regel) Briq,, *Ephedra ciliata* Fisch. & C.A.Mey., *Onosma barsczewskii* Lipsky, *Bromus scoparius* Guss association. This association 2020 year on April 12 Sayrob village around (N38°3'59.24"E 66°58'16.88") The soil is reddish sand, and the slope is 33° north. In association plants the q package *A. turkestanica* -27%, *E. ciliata* -5%, *P. bulbosa* -5% organizes. The floristic composition of the association consists of plants of the following life forms: bush-1, semi-shrub -1, semi-shrub -1, perennial herbs -4, biennial -1, and annual herbs -13. The total area of the association is 118 hectares, and the productivity level is 125 kg per hectare. Vegetation cover in the association is 65%.

Ajuga turkestanica (Regel) Briq, *Artemisia tenuisecta* Nevski, *Phlomis spinidens* Nevski, *Carex pachystylis* J.Gay, *Diarthron vesiculosum* (Fisch. & C.A.Mey. ex Kar. & Kir.) C.A.Mey., *Nigella bucharica* Schipcz. association. This association was identified on May 28.2020. around the village of Gaza, Baysun district, with brown soil and a slope of 17 north (N38°10'38.79"E67°13'12.12"). The vegetation cover in the association is 18% - *A. turkestanica*, 14% - *A. tenuisecta*, and 12% - *P. spinidens*. The plants participating in the association were divided according to their life forms as follows: semi-shrub -1, semi-shrub -1, perennial herbs -7, biennial herbs -2, and annual herbs -14. The total area of the association is 129 hectares, and the productivity level is 126 kg per hectare. Plants covered 63% of the soil surface in the association.
Ajuga turkestanica (Regel) Briq, *Grambe gardjasinii* Boiss, *Bromus tectorum* L., *Inula grandis* Schrenk ex Fisch. & A.Mey. association. This association was identified on May 28.2022. near the village of Jiydalisoy, Denov district, with brown soil, on a 23° northeast slope (N38°13'51.26"E67°31'38.81"). The vegetation cover in the association is 15% *A. turkestanica*, 9% *G. gardjasinii*, 5% *B. tectorum*, and 4% *I. grandis*. The plants participating in the association were divided according to their life forms as follows: semi-shrubs -3, semi-shrubs -6, perennial herbs -12, biennial herbs -8, and annual herbs -3. The total area of the association is 440 hectares, and the productivity level is 220 kg per hectare. Plants covered 45% of the soil surface in the association.

Artemisieta tenuisectae formation. The formation occupies an area of 351 ha. It is mainly distributed in the southern part of the village of Darband, around the villages of Chashmiron of the Dehkanabad district (N38°20'18.51"E66°29'19.39"). Associations dominated by thin-leaved wormwood are distributed in the upper hills and lower mountains. As a subdominant, this species rises to an altitude of 1100-1300 m above sea level. In the formation, thin-leaved wormwood makes up 60-70% of the plant cover. It turned out that there are 2 associations of *A. turkestanica* in the formation.

Artemisia tenusecta Nevski, *Ajuga turkestanica* (Regel) Briq,, *Poa bulbosa L., Galium pamiro-alaicum* Pobed., *Sophora pachycarpa* Schrenk ex C.A.Mey. association. This association is located in the south of Cholbair village on June 26, 2020, the soil is red sandy soil, and the slope is 19° north (N38°25'28.55" E66°59'57.53"). 14% of the plant cover in the association is *A. tenusecta*, 11% is *A. turkestanica*, and 9% is *R. bulbosa*. The association consists of 3 semi-shrubs, 1 semi-shrub, 14 perennial herbs, 2 biennial herbs, and 16 annual herbs. The total area of the association is 142 ha, yield is 117 kg per hectare. Plants cover 63% of the earth's surface.

Artemisia tenusecta Nevski, *Ajuga turkestanica* (Regel) Briq, *Rosa kokanica* (Regel) Regel ex Juz., *Taraxacum maracandicum* Kovalevsk., *Koelpinia linearis* Pall. association. This association was founded on June 14, 2021, in the north-eastern part of the village of Chashmiron, Dekhkonabad district, the soil is limestone and gypsum, and the slope is 72° south (N38°22'38.80"E66°55'53.93"). 18% of the plant cover in the association is *A. tenusecta*, 12% is *A turkestanica*, and 4% is *A. bucharica*. the association, according to the life form, semi-shrubs - 2, semi-shrubs - 1, perennial grasses - 14, biennial grasses - 1, annual grasses - 18 species. The total area of the association is 149 hectares, and the productivity level is 106 kg per hectare. Projective vegetation cover is 52%.

Roseta kokanicae formation. The formation is widely distributed around the villages of Yonaqishloq, Chashmiron, Turk, and Dug'oba of the Dehqonabad district and covers an area of 245 ha. In the formation, sedge vegetation makes up 20-30% of the vegetation cover (N38°25'46.65"E67°1'4.10"). It was found out that there is 1 association in the formation of *Kokan roseta*, in which *A. turkestanica* participated.

Rosa kokanica subsp. *semenovii* (Regel & Herder), *Ajuga turkestanica* (Regel) Briq, *Mixtoherbosa* association. This association was recorded in May 28.2020 located in the eastern part of Yonakishloq, the soil is limestone, gypsum, and the slope are 32° north-east (N38°25'20.65"E 66°59'58.97"). 16% of the vegetation cover in the association is *R. kokanica,* 12%-*A. turkestanica*, 4%-*A. semenovii*, 3%-*E. intermedia*. The floristic composition of the association consists of plants of the following life forms: trees and shrubs - 2, semi-shrubs - 5, perennial herbs - 28, and annual herbs - 16. The total area of the association is 128 ha, productivity is 161 kg per hectare, and plants cover 73% of the soil surface.

Salviaeta scropullariae formation. The formation is distributed in the villages around the village of Darband and is located around the villages of Upper Darband, Dug'obasay (N 38°18'20.25"E67°22'22.88"). The formation covers an area of 232 ha and makes up 30-35% of the vegetation cover. As a result of the research, it was found that there is 1 association participating in *A. turkestanica* within the formation.

Salvia scrophulariifolia (Bunge) B.T.Drew, *Ajuga turkestanica* (Regel) Briq, *Eremurus baissunensis* O. Fedtsch*, Hordeum murinum* L.*, Elwendia hissarica* (Korovin) Pimenov & Kljuykov association. This association was studied on June 4, 2020, located in the vicinity of the village of Dugoba, the soil is red sand, and the slope is 33° west (N38°19'1.50"E38°19'1.50"). In the association, 18% of the vegetation cover is *S. scrophulariifolia*, 16% is *A. turkestanica*, and 7% is *E. baissunensis*. The association includes 1 semi-shrub, 1 semi-shrub, 12 perennial herbs, 1 biennial herb, and 14 annual herbs. The total area of the association is 182 ha, yield is 141 kg per hectare. Plants cover 68% of the soil surface.

Eremuruseta luteuse formation. This formation is spread on the northern side of Darband village and covers an area of 224 ha (N38°14'40.98"E67°3'46.25"). In the formation, it was found that 28% of the vegetation cover was yellow sedge, and it contained 1 association of *Ajuga turkestanica*

Eremurus luteus O. Fedtsch*, Ajuga turkestanica* (Regel) Briq, *Prangos pabularia* Lindl.*, Taeniatherum caputmedusae* (L.) Nevski*, Koelpinia linearis* Pall. association. This association was founded on May 14, 2021, located in the village of Pasurkhisoy, the soil is stony gravel, reddish in color, and the slope is 27° south (N38°11'16.79"E67°2'2.69"). 23% of the vegetation cover in the association was *E. baissunensis*, 17% was *A. turkestanica*, and 6% was *P. pabularia*.

According to the life form of the identified plants participating in the various herbaceous – *A. turkestanica – E. luteus* association, there are 87 plants: semi-shrubs - 3, semi-shrubs - 1, perennial herbs - 4, biennial herbs - 2, annual herbs - 16. The total area of the association is 153 ha, the productivity is 113 kg per hectare, and the projected coverage of plants is 55%.

Arishradeta bucharicae formation. The formation is spread on the north, west side of Darband village and occupies an area of 214 ha (N38°12'8.53"E67°6'42.73"). In the formation, *A. bucharicae* makes up 33% of the vegetation cover. It was found that there is 1 association in the *A. bucharicae* Formation of Bukhara.

Arishrada bucharica (M.Pop.)*, Ajuga turkestanica* (Regel) Briq, *Gallium pamiro-alaicum* Pobed.*, Gallium spurium* L. association. This association was found on June 17, 2020, 1.5 km north of Darband village, distributed on stony gravelly red sandy soil at a slope of 28°N (N38°13'2.73"E67°0'30.49"). 23% of the vegetation cover in the association is *A. bucharica*, 18% is *A. turkestanica*, and 9% is *G. pamiro-alaicum*. According to the life form of the identified plants participating in the association of various herbs - *A. turkestanica – A. bucharica*: semi-shrubs - 2, semi-shrubs - 1, perennial herbs - 16, biennial herbs - 1, annual herbs - 19 species. The total area of association 89 is 134 ha, yield is 162 kg per hectare. Vegetation cover in the association is 78%. *Prangoseta pabulariae* formation. The formation is spread around the village of Darband, covers an area of 218 ha, and rises to an altitude of 1200-1300 m above sea level (N38°11'25.01"E67°4'49.14"). In the formation Shashir, made up 15-20% of vegetation cover. 1 association with the participation of *A. turkestanica* was identified in the formation.

Prangos pabularia Lindl.*, Artemisia tenuisecta* Nevski*, Ajuga turkestanica* (Regel) Briq, *Galium pamiro-alaicum* Pobed.*, Prunus erythrocarpa* (Nevski) Gilli*, Poa bulbosa* L. association. This association was identified on May 8, 2021, in the southwestern part of the village of Charvoqsoy, the soil is brown, and the slope was determined on the northern slope of 75° (N38°26'2.41"E67°0'44.05"). In the association, 17% of the plant cover is *P. pabularia*, 14% is *A. tenusecta*, 11% is *A. turkestanica*, and 8% is *I. macrophylla*. According to the life form of the plants participating in the association, there are 91 semi-shrubs -2, semi-shrubs -1, perennial grasses -14, biennial grasses -1, and annual grasses -18. The total area of the association is 138 ha, productivity is 156 kg per hectare, and the vegetation cover in the association is 76%.

Geobotanical studies were also carried out in the research aimed at determining the raw material reserves of *A. turkestanica*. As a result of our research, the participation of the studied species in the plant communities, their position, the floristic composition, and the structure of the communities were determined. It was determined and described that 11 new associations are formed in 7 formations of the *A. turkestanica* (47).

A.turkestanica (Regel) Brig. of raw materials. *A. turkestanica* (Regel) Brig. of (within the area) thick growing areas were divided into 3 categories and 21 arrays (Table 5).

Table-5. Natural resource *Ajuga turkestanica* (Regel) Briq. in Uzbekistan

The names of the regions where the main reserves are located	Field category	Areas (in ha)	Plant raw materials in the fields, (in ha/kg)	Dry biomass of the plant, t.		The amount of reserves prepared in one year, t.
				biological resource	reserve that can be used	
Turkqishloq	I	118	187±8,8	0,654±0,6	0,489±0,03	0,2±0,01
Beliboyli	II	124	175±8,2	0,700±0,4	0,606±0,04	0,4±0,02

Oqqishloq	II	112	168±7,8	0,336±0,2	0,290±0,02	0,2±0,01
Yonaqishloq	I	128	161±7,5	1,2±0,12	0,921 ±0,07	0,7±0,02
Kachaksoy	I	114	187±8,8	0,935±0,9	0,805±0,08	0,5±0,02
Murgagqishloq	III	118	161±7,5	0,289±0,8	0,160±0,02	0,6±0,03
Kattaqishloq	II	115	150±7,1	0,900±0,9	0,776±0,07	0,2±0,01
Chashmiron	II	149	106±4,9	0,954±0,8	0,822±0,06	0,2±0,01
Qizildaryo	III	116	137±6,4	0,822±0,3	0,145±0,02	0,1 ±0,05
Laylik, Boykurgan	III	128	210±10,2	6,70±6,7	4,4±4,6	2,2±1,1
Pachkamar, Langar ota, Akdagana, Chit	I	120	114±9,8	14,6±10,3	9,9±5,6	6,2±3,2
Darband	I	1100	156±12,9	17,1±0,8	7,4±0,8	6,1±0,06
Chorvoq	III	138	156±12,1	2,8±0,2	1,9±0,3	1,2±0,01
Sisanaga	II	42	117±11,8	4,9±0,1	0,9±0,1	0,5±0,02
Gaza	I	129	126±8,2	3,6±0,3	2,7±0,2	1,8±0,08
Dug'oba	III	182	141±11,3	4,5±0,4	3,6±0,3	2,1±0,03
Sayrob	II	118	125±5,9	14,7±2,4	1,2±0,1	0,6±0,03
Pasurxi	II	153	113±6,7	2,5±0,2	1,8±0,3	1,1±0,01
Cholbair	II	142	162±7,6	2,4±7,6	1,9±0,3	1,0±0,01
Jiydalisoy	III	440	220±12,5	23,65±13,4	16,0±9,8	14,5±9,8
Bozortepa, Dashtigaz, Inqabad, Fangart	I	230	218±9,8	12,5±5,6	6,8±3,4	2,5±1,1
Total:		4016		93,5±3,3	46,2±3,8	28,4±5,42

Type I consists of 6 massives, and we included areas 800-1200 m above sea level, where vegetation grows thickly, where raw materials are easily transported by transport, and which are close to populated villages.

The 1st massive is in the surroundings of the Turk village of Kichikoradaryo, and *A. turkestanica* (Regel) Brig. is found only at heights characteristic of category I. The total area of the massive is 118 ha, the yield is 187 kg per hectare, and the total reserve is 654,5 kg.

The 2nd massive was found in the surroundings of Yonakishlok of Kichikoradaryo. Here *A. turkestanica* (Regel) Brig. Occurs at the height characteristic of the I -category. Its total area is 128 ha, productivity is 161 kg per hectare, and natural reserve is 1,2 tons.

The 3 rd massive is distributed around the village of Darband of the Machoy river riverbed. Here *A. turkestanica* (Regel) Brig. Occurs at heights characteristic of I -category. The massive's total area is 1100 ha, its yield is 156 kg per hectare, and its nature reserve is 17,1 tons.

Array 4 is located around the village of Gaza near Baysun. *A. turkestanica* (Regel) Brig. Occurs at heights characteristic of I -category. The total area of the massive is 129 hectares, the yield is 126 kg per hectare, and the natural reserve is 3,6 tons.

Massive 5 is distributed only in the plains in the I-type around the village of Pasurkhi, Baysun district, its total area is 63 ha, the yield is 153 kg per hectare, and the natural reserve is 2,5 t.

The 6th massive is distributed only in plains in the I-type around the villages of Bozortepa, Dashtigaz, Inqobod, Koshbulok, and Fangart of Baysun district, its total area is 230 ha, and the yield is 218 kg per hectare, and the natural reserve is 12,535 tons. *A. turkestanica* (Regel) Brig. biological reserve of 37,584 tons.

Type II consists of 10 massives, which are 1200-1800 m above sea level, where the vegetation is not very thick or where the vegetation is thick, where the traffic cannot come closer than 2-3 km, and which are far from the population.

The 1st massive corresponds to the village of Kachaksoy of the Egrisuv riverbed. Here *A. turkestanica* (Regel) Brig. Occurs at altitudes typical of category 1. Its total area is 114 ha, productivity is 187 kg per hectare, and natural reserve is 935 kg.

2- The massive is spread around the village of Beliboyli of Kichikoradaryo, *A. turkestanica* (Regel) Brig. Occurs at a typical height of type II. The total area of the massive is 124 ha, the yield is 175 kg per hectare, and the natural reserve is 700 kg.

3- massive is in the vicinity of Aqqishlok of Kichikoradaryo, where *A. turkestanica* (Regel) Brig. Occurs at a typical height of type II. The total area of the massive is 112 ha, the productivity is 168 kg per hectare, and the natural reserve is 336.5 kg.

4- is located in the surroundings of Kattakishlok of Kichikoradaryo riverbed, where *A. turkestanica* (Regel) Brig. Occupies typical heights of category II. The massive's total area is 115 ha, its yield is 150 kg per hectare, and its nature reserve is 900 kg.

5- The massive is spread around the village of Chashmiron of the Kichikoradaryo. Here *A. turkestanica* (Regel) Brig. Occurs at a typical height of type II. Its total area is 149 ha, productivity is 106 kg per hectare, and natural reserve is 954 kg.

6- The massive is distributed around the village of Dug'oba and is found at heights characteristic of the II categories. The massive total area is 32 ha, its yield is 141 kg per hectare, and its nature reserve is 4.5 tons.

7- The massive is located in the vicinity of the village of Sisanga and has a type II distribution. The total area of *A. turkestanica* (Regel) Briq. in the massive is 182 ha, the yield is 117 kg per hectare, and the natural reserve is 4.9 tons.

8- The massive is located around the villages of Sayrob, Munchak, and Sherabad. Type II elevations are found in the massive. Here *A. turkestanica* (Regel) Brig. The total area is 118 ha, the productivity is 125 kg per hectare, and the natural reserve is 14,7 tons.

9- The massive is spread around Cholbair village, at heights typical of the II category, the total area is 118 ha, the yield is 162 kg per hectare, and the natural reserve is 2,2 tons.

Massive 10 is distributed on hills and slopes of category I in the vicinity of Kyzilcha, Pachkamar, Langar Ota, Kyzilkisloq, Okdagana, Kataltoy, Chit villages of Katta o'radaryo riverbed, the total area is 120 ha, the yield is 114 kg per hectare, and the natural reserve is 14,6 tons.

In massive type II, *A. turkestanica* (Regel) Brig. biological reserve was 43,8 tons.

Type III consists of 5 massives, which are 1,800-2,500 m above sea level, with less vegetation and no roads. If raw materials are prepared from such areas, they will have to be brought with the help of live crops.

Massive 1 is located in the Kyzyldarya riverbed. In this massive, *A. turkestanica* (Regel) Brig. It is rare compared to other massive and occurs at a height characteristic of type III. In the

massive, *A. turkestanica* (Regel) Brig. spread area is 116 ha, productivity is 137 kg per hectare, and natural reserve is 822 kg.

The 2nd massive was marked around the Murgak village of the Egrisuv. This massive corresponds to the elevations typical of category III. Its total area is 18 ha, the yield of *A. turkestanica* (Regel) Brig. is 161 kg per hectare, and its nature reserve is 289 kg.

The 3rd massive is located near the village of Charvak. In this massive, there are elevations characteristic of type III. The total area of this massive is 118 ha. yield is 156 kg per hectare, and the natural reserve is 2.8 tons.

4th massive, Denov district, around Jiydalisoy gorge, elevations of type III can be found. The total area of this massive is 440 ha. yield is 220 kg per hectare, and the natural reserve is 23,650 t.

The 5th massive is located around the villages of Laylik, Boykurgan, and Shorguzar. The total area of this massive is 128 hectares. yield is 210 kg per hectare, and the natural reserve is 6,720 t. The biological reserve of massive type III was 34,270 tons (24, 25).

In 1970-1972 in Uzbekistan, data were obtained on the phytocenotic features of *A. turkestanica.* Allanazarova U. et al. (49) studied 13 plant associations with the participation of 6 formations between the Baysuntag and Kuhitang mountain ranges (48). In 2020-2022, employees of the Laboratory of Biology of Medicinal and industrial plants conducted geobotanical studies in the mountainous regions of the southern regions of Uzbekistan.

As a result of the research, 11 new associations of *A. turkestanica* were established in 7 formations. Based on the data obtained, a map scheme was compiled showing the prevalence of *A. turkestanica* in the south of Uzbekistan.

Conclusion. The ontogeny of the plant **was divided into 3 periods and 9 growth stages. The level of productivity of seed production on average for 3 years amounted to 70.4%. From the 1st bush of *A. turkestanica*, on average, 72.7±5.9 buds, 62.6±2.95 flowers, and 51.2±2.36 fruits were obtained, respectively.** The weight of 1000 pieces of *A. turkestanica* seeds was 20.20 grams.

For the first time, 7 formations and 11 associations of A. turkestanica were described. The associations include 272 species of higher plants, and according to the life forms of these species, 17 (5%) tree-shrub, 15 (4%) semi-shrub and semi-shrub, 88 (40%) perennial grasses, 107 (51%) biennial grasses - and annual species. **The current area of *A. turkestanica* (Regel) Brig. in Uzbekistan is 4016 ha, the biological stock is 93.5±35.3 tons, the available stock is 46.2±13.8 tons, the annual stock is 28.4±5.42 tons.**

REFERENCES

1. Khojimatov O, Khamraeva D.T, Khujanov A, Bussmann R. An overview of Ethnomedicinal plants of Uzbekistan. Ethnobotany Research and Applications, 2020. 20.10.32859/era.20.08.1-19.
2. Pratov U.P, Odilov T.O. Modern system of families and Uzbek names of higher plants of Uzbekistan. Methodical recommendation. Tashkent: Fan; 1995. p. 39.
3. Khanov M.T, Sultanov MB, Egorov T.A. Pharmacology of alkaloids and cardiac glycosides. Tashkent: Fan; 1971, p. 210-211.
4. Khozhimatov K.Kh. Aromatic and aromatic plants of Uzbekistan. Tashkent: Fan; 1992. p.56-57

5. Sennikov A.N, Tojiboev K.Sh, Khassanov F.O, Beshko N.Yu. The flora of Uzbekistan project. Phytotaxa, 2016; 282:107-118.
6. Vvedenskiy A.I. Flora of Uzbekistan. Vol. 5, AS SSR: 1961. p. 266-277.
7. Zakhidov U.B, Nabiev A.N, Khushbaktova Z.A, Syrov V.N. The influence of the total iridoid preparation from the Turkestan tenacious on the activity of liver monooxygenases when it is damaged by carbon tetrachloride. Uzbek biology J. 2000; 3:7-10.
8. Soatov Z, Horowitz M.B, Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. *Chem. Nat. Compounds,* 1993; 5:627.
9. Mamadalieva N.Z, El-Ready M.Z, Ovidi E, Ashour M.L, Hamoud R, Sagdullaev S.S, Azimova S.Sh., Tiezzi A, Wink M. 2013. Antiproliferative, antimicrobial and antioxidant activities of the chemical constituents of *Ajuga turkestanica*. Phytopharmacology. 2013;4(1):1-18.
10. Abdukadirov I.T, Yakubova M.R, Nuriddinov Kh.R, Mamatkhanov A.U, Turakhozhaev MT. 2005. Ecdysterone and turkesterone in *Ajuga turkestanica* determined by HPLC. *Chem. Nat. Compounds,* 41(4): 475–476.
11. Bakrim A, Ngunjiri J, Crouzet S, Guibout L, Balducci C, Girault J.P, Lafont R. Ecdysteroid profiles of two *Ajuga species, A.iva,* and *A.remota*. Nat. Pro. Com, 2014; 9 (8):1069–1074.
12. Dinan L. The Karlson lecture. Phytoecdysteroids: what use are they? Arch Insect Biochem Physiol 2009, 72: 126–141.
13. Ganiev Sh.G., Khamidkhodjaev S.A., Djuharova M.X., Saatov Z. *Ajuga turkestanica* from Baysuntay (Baysun mountain). Uzbek Biol J: 1990; 1: 30-32.
14. Grace M.H, Cheng D.M, Raskin I, Lila M.A. Neo-clerodane diterpenes from *Ajuga turkestanica*. Phytochem Lett. 2008; 1: 81–84.
15. Israili Z.H, Lyoussi B. Ethnopharmacology of the plants of genus *Ajuga.* Pak J. Pharm Sci 2009; 22(4): 425-462.
16. Khalitova Y.D, Syrov V.N, Akhmedkhodjaeva Kh.S, Mamatkhanov A.U. Possible use of the extract of *Ajuga turkestanica* as a remedy contributing to lactation. Dokl Akad Sciences RUz 1998; 8: 35-38.
17. Kokoska L, Janovska D. Chemistry and pharmacology of *Rhaponticum carthamoides*: a review. Phytochem, 2009; 70: 842-855.
18. Kutepova T.A, Syrov V.N, Khushbaktova Z.A, Saatov Z. Hypoglycemic activity of the total ecdysteroid extract from *Ajuga turkestanica*. Pharm Chem J. 2001; 35(11): 608–609.
19. Mamadalieva N.Z., Phytoecdysteroids: chemistry and occurrence. In Natural Compounds: Plant Sources, Structure, and Properties, 2013; 6:1-18.
20. Mamatkhanov A.U, Yakubova M.R, Syrov V.N. Isolation of turkesterone from the epigeal part of *Ajuga turkestanica* and its anabolic activity. Chem Nat Comds 1998;34(2):150-154.
21. Saatov Z, Syrov V.N, Mamatkhanov A.U, Abubakirov N.K. Phytoecdysteroids of plants of the genus *Ajuga* and their biological activity. I Distribution and chemical structures of the compounds isolated. *Chemistry of Natural Compounds.* 1994; 30(2): 138-145.
22. Saatov Z, Usmanov B.Z, Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. IV. *Chem Nat. Compounds.* 1977; 13(3): 359.
23. Shakhmurova G.A, Syrov V.N, Khushbaktova Z.A. Immunomodulating and antistress activity of ecdysterone and turkesterone under immobilization-induced stress conditions in mice. Pharm. Chem. Journal 2010; 44 (1): 7-9.

24. Syrov V.N, Khushbaktova Z.A, Tolibaev I, Mamatkhanov A.U. Effect of a lipid concentrate from the aboveground portion of *Ajuga turkestanica* on the metabolic processes and dynamics of healing skin wounds experimentally. Pharm Chem J. 1994; 28(11): 837-840.
25. Usmanov B.Z, Gorovits M.B, Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. *Chem. Nat. Compounds.* 1971; 7(4): 520.
26. Usmanov B.Z, Gorovits M.B., Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. II. *Chem. Nat. Compounds.* 1973; 9(1): 125.
27. Usmanov B.Z, Gorovits M.B, Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. III. The structure of turkesterone. *Chem. Nat. Compounds.* 1975; 11(4): 484-487.
28. Usmanov B.Z, Rahkes Ya.V, Abubakirov N.K. Phytoecdysones of *Ajuga turkestanica*. VI. Acetylcyasterone. *Chem. Nat. Compounds.* 1978; 14(2): 175-178.
29. Zubeldia J.M, Hernández-Santana A, Jiménez-del-Rio M, Pérez-López V, Pérez-Machin R, Garcia-Castellano J.M. *In vitro* characterization of the efficacy and safety profile of a proprietary *Ajuga turkestanica* extract. Chin. Med, 2012; 3: 215–22.
30. Beideman I.N. Methodology of the study of plant phenology and plant communities. Novosibirsk: Science; 1974.
31. Rabotnov T.A. Life of perennial herbaceous plantations and meadow cenosacs. W. Botan. inst. AS Ukrainian SSR. 1950; 6: 7-204.
32. Rabotnov, T.A, Study of flowering and pollination of plants. Field geobotany. Moscow, Fan Press. Ukrainian SSR. 1960; 2: 919.
33. Lishchuk S.S. Method for determining the mass of seeds, Bot. Journal. 1991; 76 (11):1623-1624.
34. Maltsev I.I. Methodology for assessing the reserves of raw materials of medicinal plants in the mountainous regions of Central Asia. Plant resources.1990; 26 (1):96-103.
35. Maltsev I.I, Umarov T.A. Methodology for assessing the stocks of material coastal species in the mountainous regions of Central Asia. Plant resources. 1991; 27 (2):118-123.
36. Shreter A.I. Methodology for determining the reserves of medicinal plants. Moskow: Science; 1986, p. 2-45.
37. Ashurmetov O.A. Methods of studying seed productivity by the example of species of the genus *Glycyrrhiza* L. Increasing feed production on a scientific basis. Tashkent,1982, p. 48-50.
38. Ashurmetov O.A., Karshiboev H.K. Methodological instruments for studying the process of reproduction in plants. Tashkent: Fan; 2008. p. 22.
39. Zhukova L.A. Some aspects of the study of the ontogeny of seed plants. Question ontogenesis of plants. Yoshkar-Ola. 1988, p. 3-14.
40. Egamberdiev A.E. *Ajuga turkestanica* in Baysuntau. 3-International scientist and practitioner conference. Turkestan and the stages of formation of the science of education in Central Asia Kazakhstan. Shymkent. 2000, p. 87-88.
41. Egamberdiev A.E, Nigmatullaev A.M. Distribution and resources of *Ajuga turkestanica* in Uzbekistan. Materials of the international scientific conference dedicated to the 70th anniversary of the Institute of Botany and Phoytointroduction. "Prospective development of botanical science in Kazakhstan". Almaty, 2002, p. 344-345.

42. Egamberdiev A.E, Norboboeva T. Mapping of pasture vegetation of fields on the Machaidarya River. 6th Pushchinskaya School- conference for young scientists. "Biology - Science of the 21st Century". Collection of technologies. Pushchina 2002. p.205.
43. Egamberdiev A.E. The role of *Ajuga turkestanica* in the vegetation cover, which is widespread in the south of Uzbekistan. GulSU notification; 2003. p. 4-28.
44. Egamberdiev A.E. *Ajuga* (*Ajuga turkestanica*) (Regel) Brig. place in the plant community. II Republican Conference of Young Botanic Scientists. Tashkent. 2000, p. 82.
45. Egamberdiev A.E., Nigmatullaev A.M. Raw materials and phytocenoses *Ajuga turkestanitsa* in the south of Uzbekistan. *Chemistry of Natural Compounds.* 2002; 8:245-247.
46. Egamberdiev A.E, Nigmatullaev A.M. Raw materials of *Ajuga turkestanica*. Bulletin of agricultural science of Uzbekistan. 2002; 6: 135-137.
47. Egamberdiev A.E, Nigmatullaev B.N. South of Uzbekistan *Ajida turkestanica* (Regel) Briq. Phytocenotic of spread. Bulletin of Uzbekistan National University. 2022. p. 57-62.
48. Egamberdiev A.E, Nigmatullaev A.M, Makhkamov T. Some of Uzbekistan *Ajuga turkestanica* (Regel) Briq. in their gods (*Lamiaceae*) distribution and raw materials reserves GulSU notification; 2022. p. 36-47.
49. Allanazarova U, Butkov A.Ya, Khamidov G.Kh. Mountain deciduous forests and mesophilic shrubs - *Therodendra*. The vegetation cover of Uzbekistan and ways of its rational use. Tashkent: Fan; Tashkent. Press Fan; 1984. p. 3-85.