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Research on Agricultural Significance and Resistance to Pests and Diseases of Horse Beans (VİCİA FABA L.) in Azerbaijan

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Abstract: ***At all times, the determining standard of the socio-economic development of a civilized state was the standard of living of its population, the main indicator of which is the level of consumption of vital food products, including consumption of fruits and vegetables. The role of legumes in effectively meeting the demand of the population for proteins is indisputable. Proteins rich in amino acids, vitamins and minerals make beans a high-quality food. In order to meet the demand of the population in beans through local production, it is necessary to create stable and high-yielding varieties. In Azerbaijan, the sowing of vegetable beans does not have much production value. The culture is mainly used for research purposes and is cultivated in small areas, like garden. Therefore, the study of the morphobiological features of plants of the prospective variety in each region and the comprehensive study of the genetic resources of culture is relevant. The article is devoted to the results of a study of the local gene pool of horse or fodder beans and materials from ICARDA. Yield and analysis of crop structure, disease resistance were analyzed. One of the reasons for the limited sowing of leguminous plants is the presence in their seeds of various concentrations of taian and such food additives as vitcin and konvitsin. These supplements contribute to the breakdown of red blood cells. This disease was given the name "fabismus" in accordance with the name of the beans. In the middle of the last century, the amount of this disease has greatly increased in the south of Azerbaijan. For this reason, in the 60s of the last century there were many social measures to limit the cultivation of legumes. In order to enrich the collection, samples Flip15-100FB, Flip15-077FB, Flip15-096FB, Flip15-097FB, Flip15-079FB, Flip15-061FB, Flip15-098FB, Flip15-099 FB, ICAWHAZ with white flowers, which were immune resistant, were selected, fertile, with low levels of harmful substances. Since samples with a low level of harmful substances are new for our republic. These studies are an important initial study for the subsequent production of new varieties. We hope that this will lead to an increase in the acreage of legumes in our republic. The aim of the research was to study the variability of the morphometric and biochemical characteristics of the introduced beans and the creation of the initial material for the selection of new varieties. Research and study of the possibilities of new, as well as, already known varieties, can help in achieving this goal. In general, the collection, study and reproduction of legumes, known as a healthy and effective alternative source of protein in a person's daily diet requires the creation of new varieties.***

Keywords: bean, selection, source material, sort, diseases, harmful substances

1. Introduction

The genetic diversity of leguminous plants plays an important role in ensuring food safety and sustainable development of agriculture. These plants are a priority in the modern world since they are considered as the main components of the consumer basket that can meet the daily need for protein and be considered an alternative nutrition. The importance of legumes, as an alternative source of nutrition, is associated with the content of essential amino acids, as well as vitamins, minerals and microelements. Nowadays, the search for cheap and profitable cereals occupies the minds of mankind, while the use of legumes can be one of the possible solutions. Replacement of animal protein with plant protein in daily diet may reduce the demand for cattle breeding and serve as a reason for replacing pastures with croplands. On the other hand, the fixation of atmospheric nitrogen by leguminous crops can reduce the technogenic load on the soil. Despite the fact that the size of mycobacterium by bacteria of atmospheric nitrogen is different for legumes, they are a good prerequisite for summer and autumn crops [2; 19]. Their positive impact lasts for 2 years and has a beneficial result on fertility (R.L.Tate, 1995). Most scientists claim that while reseeding legumes, 15-20% less nitrogen fertilizers are used [11; 17; 21; 25].After the harvest, the roots and discarded plant parts remain on the ground, which are a cheap and environmentally friendly source of nitrogen and potasium (45-130 kg \ ha N; 10-20 kg \ ha F və 20-70 kg \ ha K) [1; 18].

The instability in the global food market had a negative impact on the Azerbaijani market as well. At the same time, the lack of theoretical awareness and the absence of new fertile legume varieties resistant to pests and diseases create difficulties. Given the inability to meet local demand of legume products for food and fodder with local food production, it is extremely important to evaluate food legumes by their economic value, resistance to diseases and pests.

The limited possibilities of expanding sown areas, unfavorable environmental conditions, the effects of anthropogenic factors do not allow the full realization of the creation of varieties resistant to pests and diseases. It is important to study the effect of these plants on stress factors, resistance to diseases and pests, it is also very important to use donor forms with valuable biological and agronomic characteristics for future selection. Selected donor forms should be able to effectively realize their genetic potential in the difficult soil and climatic conditions of the Republic.

Thus, the created new variety should correspond to the conditions of the region, the type of soil, meteorological factors, disease, level of plant cultivation, agro-technical conditions and environmental factors.

Since ancient times, horse bean has been one of the most widely used types of food legumes. Horse beans are grown in private farms in the southern regions of Azerbaijan and are sold in local markets. Despite the lack of accurate statistical data, production is estimated to be 180-360 tons / year.

2. Literature Review

Although, the legume belongs to the Vicia L. genus, even before Linnaeus, Turnefort attributed this legume to the correct genus faba-,Meduku, Adanson and some other botanists (Seringe, Alefeld, Hazz, Trabut) also recognized this classification. It differs from *Vicia* in the triarchroot trunk (Vicia is tetraarch), the empty from the inside cordate body, the long oblongated fruit and other features [10].V. Muratova was the first to propose to study the samples of legumes by their morphological characteristics and the anatomical structure of the grain coating, and also, when studying the wild types, to consider them as a free species of *V.Pliniana* (Trabut) Murat [16]. Bean planting begins in the east of California and ends on the Japanese islands. Board bean has long been cultivated by people for nutrition. This can be proven by the remaining found in a number of European countries belonging to the stone, copper and iron era. Evidence shows that the first crops of legumes belong to the Stone Age [2, 7, 11].These grains were found in the tomb of the Egyptian pharaoh, who lived in 2400 BC. In Greece and Rome, legumes were used in cooking, hence the name "faba", which translates as "food" [14]. Despite numerous studies, the origin of legumes is still a contentious issue [12].This comes from a very limited number of testimonies of *Vicia faba L*. Sowing and the consumption of legumes began in the Middle East, and spread widely during the Neolithic age [17]. Awareness in other Mediterranean countries, and the fact that we can meet their names in four other ancient languages (Greek, Arabic, etc.) confirms this theory. Apparently, legumes appeared under the influence of varieties of *Vicia* from the wilds grown at that time. In ancient Egypt, legumes were a poor man's meal. In Macedonia, beans were not only nutritious food, but also used as a green fertilizer. It is known about the use of beans in food in the Scandinavian countries, Germany and France since the 13 th century. Beanshave come to Russia from Western Europe, and to Georgia from Asia Minor or Greece. Since the 19 th century, white, sweet windsor, wide green windsor, wide Italian and fertile dwarf legumes were grown in Russia. There is no accurate research on bringing board beans to Azerbaijan. During Soviet times, the cultivation of board beans was advised in the front Caucasus, and especially in the Lankaran region of Azerbaijan. Some of these beans belonged to the Mediterranean group (it was characterized by tall-growing, wide flowers and leaves of light shades, with indehiscent pods, brown, flat and cylindrical grains), and the other to the *var.equina* (Reichb.) *subvar.rugosa*.sub-type. Murat.,*f.mediterranea* Murat (it was characterized by short stature (55-70 cm), a small number of branches (2-3 pieces), pink-yellow (laterint), medium-sized, longer fast-ripening grains) [16]. During the ripening phase, the inclination of the stem of the plant to the ground led to the loss of the pulse. During the Soviet times, this type bore the name "Lankaran Bob", sowing occurred in spring and autumn [7; 20].

Currently, horse faba beans are grown in the north and south, in the highlands, even at an altitude of 4,200 meters above sea level. Most of all planted in China (882 million hectares), Ethiopia (512 million hectares), Morocco (197 million tons). In Russia, horse bean crops planted on about 12 thousand hectares. The main bean producers are China (2 million tons) and European countries (1 million tons), Ethiopia (0.4 million tons), Egypt (0.2 million tons) and Australia (0.2 million tons). The main source of legume grains is Europe (0.7 million tons).

Legumes crops for food and fodder are growing, according to FAO STAT, annually about 16 million tons of legumes grains are produced.

3. Materials and Methodologies

The studies were conducted in 2013-2018 at the Institute of Genetic Resources (IGR) of the National Academy of Sciences (NAS) of Azerbaijan. The Scientific-Experimental Base is located on the Absheron peninsula (80 m above sea level), in a dry subtropical climate with very sunny and dry summers, warm and sunny falls, and mild and almost snowless winters. The average temperature is 13.5-14.5^{0}C. Frost in winter is rare. In summer, the temperature climbs up to 38-40^{0}C, and since 2010 this can reach to 40-45^{0}C. The driest months are July and August. Most of the rainfalls occur in winter-spring period. Average yearly rainfall is mediocre and constitutes 120-150 mm, relative humidity is 70,6%. Summer is almost always dry. The soil is sandy and very poor. Caspian Sea and semi-arid plains surrounding the peninsula has big impact to the climate.

The following methods were used during the research: state method of testing plant varieties (1989), Methodology for the definition of a key set of characterization and evaluation descriptors for faba bean (*Vicia faba*). (2011) [8; 15].

Sowing of collection samples was carried out in duplicate with an area of food of one plant 10 x 45 cm at the optimum time, in the fall at the end of November. A standard sample was sown after every 10 samples, with the Method of systematic placement of experimental plots. In the process of growing, the ranks made phenological observations, determined the time of onset of phenological phases. The onset of the phase was noted when there were signs in 10% of the plants, and complete - in the presence of signs in 75% of the plants. The dates of the onset of the main phases and interphase periods were noted: seedlings, flowering, fruiting, and ripening of beans. In connection with the above, in Azerbaijan, studies were conducted on the study of agrobiological features of beans in the conditions of the Absheron Peninsula.

Has been conducted structural analysis of plants for valuable breeding characteristics that determine seed productivity and adaptability to mechanized cultivation. Evaluation of all samples was carried out when compared with the standard. The height of the plant from the soil to its highest point (cm), the height of attachment of the lower bean (cm), the number of beans per plant, the mass of seeds from one plant, and the mass of 1000 seeds (g) have been measured.

154 samples were used as research material: 27 of them were local forms and 103 were samples obtained from ICARDA. Among the ICARDA samples used, 83 are fertile, and 20 resistant to ascohytosis were compared with local forms.

During the study of plants, phenol logical observations were carried out, the samples were evaluated by quantitative and qualitative characteristics, and correlation relations were determined between them.

4. Research and Results

Fertility of food beans is a complex trait, which is determined by the number of beans in a plant, the number of grains in a plant and the density of grains in the beans, and is calculated from a sample of 1000 plants. The plants are very sensitive to environmental characteristics: they quickly respond to changes in weather and soil conditions, feeding and irrigation.

While local forms of horse beans slightly differ in size (7.2-8.9 cm), samples obtained from ICARDA show a greater diversity (7.5-22.5 cm). By the size of the bean, the best indicators are in Aquadulce (17-20 cm), Giza 3 (14-19 cm), AsCOT (12-14 cm) and VİFA-İSPAN (25-27 cm) obtained in Spain. These samples are important as vegetables (green beans consumption).

The average height of plants at the standard was 107 cm, for collection samples - from 45 to 115 cm. The number of beans per plant was 29 for standard, for collection samples from 7 to 31 beans (Xav = 22.12 pcs; VC = 17.21%). The best indicators among the local forms are VİFA-3-93, VİFA-73 (26 pcs.) and VİFA-2-93 (29 pcs.). Among the samples obtained in ICARDA, the best are FLİP15-030FB (31 pcs.) and FLİP15-044 FB (31 pcs.).

The number of seeds per plant is 60 for standard and 15 to 87 for collection samples (Xav = 36.98; VC = 20.47%) of seeds. The largest number of grains in VİFA-57 (57 pcs.), VİFA-2-93 (60 pcs.), FLİP15-030 FB (81 pcs.), FLİP15-044 FB (87 pcs.); and the lowest in FLİP15-035 FB (15 pcs.), FLİP15-032FB (17 pcs.), FLİ15-034 FB (17 pcs.), FLİP15-029 FB (17 pcs.).

The seed weight per plant is 68 g for a standard, 15 to 87 g for collection samples (Xav = 35.58 g; VC = 23.01%). In the studied samples, the lowest seed mass from one plant was observed for samples FLİP15-033 FB (15.3 g), FLİP15-040 FB (15.6 g), FLİP15-034 FB (16.0 g), FLİP15-035 FB (16.9 g), the highest seed mass per plant in samples FLİP12-176 (53.1 g), VİFA-57 (56,84 g), VİFA 2-93 (68,12 g), No.- 18 (74.6 g), FLİP15-030 FB (87.2 g).

The mass of 1000 seeds for the standard was 1091 g, for collection samples from 635 to 1660 grams (Xav = 951 g; VC = 157.19%). Comparison of the weight of 1000 seeds with standard VİFA-2-93 (1091 g) was the largest sample FLİP12-139 (1215 g), Aquadulce (1291 g), FLİP12-183 (1428 g), Giza 3 (1487 g), VİFA -SPAN (1660). Among horse beans, the highest mass is 1000 seeds in samples of Giza 3-1487 g and VİFA-SPAN-1660 g, and the lowest in sample FLİP15-003FB (623 g).

It should be noted that the importance of the mass of 1000 seeds per beans varies depending on the direction of cultivation. Studies show that despite the fact that plants with large grains are more rapidly growing (1 month faster than small grains) and important as vegetables, they require large areas of crop (2-4 times smaller grains), while At the same time, modern sowing units are designed for small grains. From this it follows that the use of samples FLİP15-003FB (623 g), FLİP12-059 FB (760 g), FLİP12-060 FB (789 g) for selection would be more correct.

The mass of seeds from 1 m2 for standard VİFA-2-93 was 900.0 g. This indicator for collection samples varied from 100.0 g to 1000.0 g.

From the experience of breeding it is known that one of the main conditions is the study by the breeder the correlation between the elements of fertility. The choice of one indicator directly or indirectly affects changes in the other. In this case, the correlation of elements is measured by its volume and characteristics of the impact, and the degree of correlation from the relativity of variability and dependence on the year of study. Correlation coefficients are the most convenient indicator for studying the interdependence of quantitative traits. The results of the study of correlations are of interest when creating adaptive genotypes and obtaining the required performance characteristics. In the literature there is little data on the relationship of quantitative traits in beans [6; 13].

The indicators obtained during our studies suggest that all the structural elements of all the samples included in the selection are interdependent, and the increase in one of them does not lead to an increase in overall fertility.

The results of the correlation analysis revealed a correlation of genotypes of faba bean fertility indicators:

1) A direct high positive relationship is noted between the height of the plant and the number of beans per plant (r = 0.34 **), between the number of seeds per plant and the mass of seeds per plant (r = 0.79 **), between the mass of seeds on the plant and mass of 1000 seeds (r = 0.47 **), between the number of seeds per plant and yield (r = 0.33 **), mass of 1000 seeds and yield (r = 0.39 **);
2) The average positive correlation is noted between the height of the plant and the mass of seeds on the plant (r = 0.26 *), between the number of beans per plant and the mass of seeds on the plant (r = 0.23 *), between the number of beans per plant and the number of seeds per plant (r = 0.31 *);
3) A strong negative relationship is noted between the number of beans per plant and yield (r = -0.30).

Studies have shown that to meet the need for seeds of beans, it is necessary to create new varieties, models of which combine, along with morphological features (compact bush, high attachment of the lower bean) and a set of economically useful traits. In order to more accurately compare the samples of productivity and suitability for mechanized harvesting of the samples of beans, they were divided into groups using cluster analysis [22].

To analyze the results of the study of the main economically valuable traits in the studied samples of the rank, the method of cluster analysis was used. To construct the dendrograms, the Euclidean distance and the method of unweighted pairwise grouping with averaging (UPGMA - unweighted pair group method using arithmetic averages) were used. According to the most important economically valuable attributes (plant height, height of attachment of the lower bean, number of beans and seeds per plant, seed weight per plant and 1000 seed weight, biological productivity), a statistical analysis was performed using the SPSS software package with further grouping.

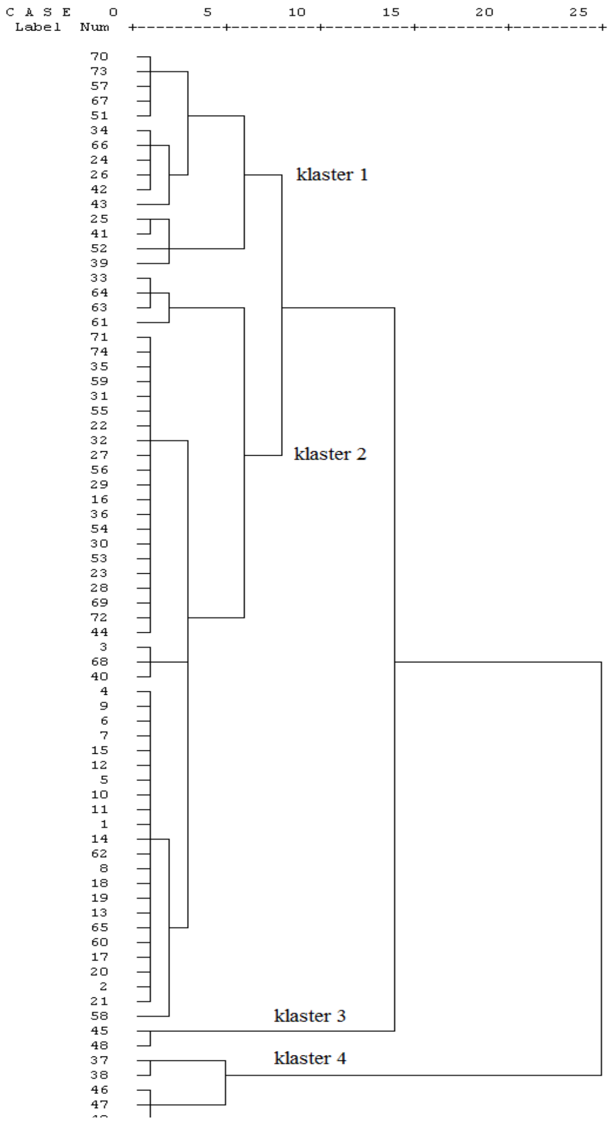

Figure1: Dendrogram of clustering of faba bean samples on the elements of productivity and suitability for mechanical collection

In Figure 1 it can be seen that all the studied genotypes according to the aggregate morphological characters were classified into 4 main clusters. The resulting dendrogram made it possible to group genotypes depending on the level of seed productivity.

Cluster I is characterized as medium-high and high-yielding samples. Samples FLİP15-012FB, AsCOT, FLİP15-009FB, FLİP 15-008FB, FLİP12-063 are characterized as large-seed, medium-growing and high-yielding.

Cluster II includes a large number of samples (40.5%). Cluster II is characterized as low-growing and small-seeded samples. Samples FLIP15-032FB, FLIP15-034FB, FLIP15-027FB, FLIP15-038FB, FLIP15-048FB are characterized as undersized and small-seeded.

Among the samples of cluster III, 78.2% are local forms. Cluster III is characterized as tall, small-seeded and low-yielding samples. Samples VIFA-57, VIFA-5-94, FLIP15-008FB, FLIP15-003FB are characterized as tall, small-seeded and low-yielding

IV cluster includes only 6.7% of the sample. These samples are tall, large-seeded and high-yielding. Samples of Aquadulce, Giza 3, Elisar are characterized as tall, high-seeded and high-yielding.

As a result of the study of variety samples, beans were identified promising samples that can be successfully used as starting material for the selection of beans. When creating new varieties of beans as a crop, as a source material, more attention should be paid to plants belonging to the first and fourth clusters. The plants of these samples have a complex of positive economically valuable traits, the selection of which is most desirable for the selection of beans for high productivity.

When creating new varieties of beans as suitability for mechanized harvesting as a starting material, more attention should be paid to plants belonging to the first and second clusters. The plants of these samples have a complex of positive economically valuable traits, the selection of which is most desirable for the selection of beans for high productivity and suitability for mechanized harvesting.

Evaluation of samples by quantitative and qualitative characteristics, identifying the relationship between their characteristics, led us to the conclusion that these models of varieties are promising. The biometric analysis of the plants included in the research sample facilitated the creation of new lines and varieties for each plant (table 1).

Table1: Characteristics of the samples selected as a source of high fertility among faba beans (2013-2015)

Name of the sample	Height to the junction of the 1st bean,см	Number of nods, pcs	Number of stems	Number of beans in the plant, pcs	Number of grains in the plant, pcs	Mass of the grains in the plantgram	Number of grains in the plant, pcs	Size of the bean, cm	Mass of 1000grains, gramm	Fertility per m2, grams
St.VİFA-2-93	19	16	3	19	39	46,3	3	10,0-2,0	1190	900
FLIP15-045FB	27	18	3	15	32	34,9	3	9,0-1,5	893	1000
FLIP15-046FB	33	18	3	9	26	32,4	4	10,7-1,6	924	1000
FLİP14-004 FB	18	14	3	19	53	85,8	4	9,0-1,7	1400	1010
Elisar	26	20	4	24	56	74,6	4	10,0-1,5	1172	960
FLIP15-022FB	32	16	4	16	28	22,8	3	7,5-1,5	788	1000
Aqudulce	31	16	4	9	28	35,9	4	12,5-2,0	1291	1000
Giza 3	30	17	3	9	28	42	6	18,0-2,3	1487	1000
VİFA-İSPAN	9	16	4	10	29	48,0	5	24,5-2,1	1656	1000
Qaraca	33	16	4	58	102	89,0	3	9,2-1,5	963	1200

Nowadays, one of the main directions of legume breeding is the creation of varieties resistant to diseases. Unfortunately, the genetic characteristics and immunity mechanism of disease resistance are not well understood. In spite of it, the International Center for Agricultural Research in the Dry Areas, a joint project of England, Canada, Poland and France, revealed forms resistant to the most widespread disease among leguminous plants, ascochytosis (*Ascochyta fabae*).The 68 forms identified in (ICARDA) and resistant to ascochytosis were used in our studies in 2015-2016 (of which 24 were included in 2015, and 44 in 2016). These samples were studied in comparison with st.Fam 54 (ICARDA) and local forms VIFA-2-93. It should be noted that the susceptibility of samples to diseases has changed due to soil and climatic conditions [23; 24]. Thus, under Absheron conditions, at least some of these samples were subjected to diseases of 1-2 points. But most of them retained resistance to this disease. In our Republic, the forms FLİP115-017FB, FLİPİ5-018FB, FLİP15-041FB, FLIP16-207, FLIP16-215 were included to the lit of samples resistant to this disease.

On the Absheron Peninsula, the samples were heavily infected with black aphids, dangerous for faba bean. Exposure to this pest increases with higher percentage of moisture. Table 2 presents a list of diseases that samples were subjected to during our studies.

Table 2: The level of exposure of faba beans to diseases and pests (in points) (2008-2018)

Diseases and pests	Years									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Anthracnose	0	0	0	0	1	0	0	0	0	0
Ascochytosis	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
Fusariose	0	0	0	1	0	1	0	0	0	0
Rust	0	0	0	0	0	0	0	0	0	0
Bacteriosis	0	0	0	0	0	0	0	0	0	0
Mosaic	0	0	0	0	0	0	0	0	0	0
Granivorous	0	0	0	0	0	0	0	0	0	0
Aphid	0	0	0	0	0	0	+++	+++	+++	+++
Phyllophagous	0	0	0	0	0	0	0	0	0	0
Seed mold	0	0	0	0	1	0	2-5	0	0	2-5
Chocolate spot	1	1	1	1	1	1-2	1-2	1	1	1-2

As can be seen from Table 2, the degree of susceptibility of samples to ascochytosis is 1-2 points, while, depending on the immune characteristics, susceptibility to olive mold was estimated at 2-5 points. Strong susceptibility to dangerous black aphid was observed in 2014-2017. As a result of high humidity (over 80%) in 2014 and 2017, the samples were exposed to the fungus, *Cladosporium herbarum*- seed mold, Despite the fact that the disease was estimated at 2-5 points, it was found in relatively stable forms. Samples of FLİP14-051FB, FLİP14-013FB, FLİP14-050FB, FLİP14-001FB, FLİP14-005FB were more resistant, and FLİP14-053FB, FLİP14-058FB, FLİP14-012FB, FLİP14-016FB, FLİP14-062FB, FLIP14-010FB, FLIP14-056FB hadhigher damage rate. Samples FLİP12-132FB, FLİP12-150FB, FLİP12-063FB, FLİP12-008FB were more sensitive to anthracnose; FLİP12-054FB, st.Fam 54B, FLİP15-053FB, and FLİP15-061FB, FLİP15-069FB, FLİP15-097FB, FLİP15-025FBand FLİP15-042FB to ascohitoz.

Also in these years there was a characteristic bean disease - chocolate spot. This disease is transmitted by the fungus *Botrytis fabae* Sard of the *Hyphomycetalis* family. With frequent rains and high air humidity (above 80%), plant leaves and beans are more often exposed to this disease. In this case, the surface of the leaves appears dark circular spots (necrosis). After some time, the circumference of these spots becomes gray-red, and the inside of the gray. During a strong infection, flowers, beans and seeds also become infected. This disease is more dangerous for horse bean. In Morocco, 80% of the horse bean harvest is exposed to this disease each year [4; 5; 9].

In our study, the susceptibility of samples to this disease was estimated at 1-2 points. We can say that, this disease was found among the majority of samples (1-2 points).

One of the reasons for the limited seeding of leguminous plants is the presence of various concentrations of tannin and food additives such as vitsine and convitsine in their seeds. These supplements contribute to the breakdown of red blood cells. This disease was named as *"fabismus-fabizm"* in accordance with the name of the beans. In the middle of the last century, the number of this disease greatly increased in the south of Azerbaijan. For this reason, in the 60s of the last century there were many social measures to limit the cultivation of legumes [26; 27]. This disease has also been found in Mediterranean countries, as well as in Iran and Iraq. Most often, children under the age of 14 were exposed to it. For this reason, people are concerned of using legumes. It should also be noted that this disease is more common in people with hereditary enzyme deficiency in erythrocytes (glycoso-6-phosphate dehydrogen). For others, it is less dangerous. In recent years, a number of European countries are looking for varieties of beans that do not contain or contain very small amounts of the substance vitsine and convitsine. Even in VIR, works are being carried out to find similar genotypes. A literature review indicates that the answer may be legumes with white flowers [3]. As a result, in Pushkin laboratory 14 samples, with white flowers and with a bright scar-like sign on the grains were investigated, and the substance vitsine and convitsine are missing or contained in very small amounts.

In order to enrich the collection, samples Flip15-100FB, Flip15-077FB, Flip15-096FB, Flip15-097FB, Flip15-079FB, Flip15-061FB, Flip15-098FB, Flip15-099 FB, ICAWHAZ with white flowers, which were immune resistant, were selected, fertile, with a low level of harmful substances (tannin). Since samples with a low level of harmful substances are new for our republic, these studies are an important initial study for the subsequent production of new varieties. We hope that this will lead to an increase in the area of legume croplands in our republic.

5. Conclusion

Analysis of the relationship between the morpho-biological characteristics of the studied samples on average for 2007-2017 showed that a high positive relationship was observed between plant height and the number of beans per plant (r = 0.34 **), between the number of seeds per plant and the mass of seeds per plant (r = 0.79 **), between the mass of seeds per a plant with a mass of 1000 seeds (r = 0.47 **), between the number of seeds per plant and yield (r = 0.33 **), a mass of 1000 seeds and yield (r = 0.39 **);

- The average positive correlation is noted between the height of the plant and the mass of seeds on the plant (r = 0.26 *), between the number of beans per plant and the mass of seeds on the plant (r = 0.23 *), between the number of beans per plant and the number of seeds per plant (r = 0.31 *);
- A strong negative relationship is noted between the number of beans per plant and yield (r = -0.30).

The results of the research collection, samples were selected Flip15-100FB, Flip15-077FB, Flip15-096FB, Flip15-097FB, Flip15-079FB, Flip15-061FB, Flip15-098FB, Flip15-099 FB, ICAWHAZ with white flowers that were immunologically stable, fertile, with a low level of harmful substances (tannin). Since samples with a low level of harmful substances are new for our republic. These studies are an important initial study for the subsequent production of new varieties. We hope that this will lead to an increase in the acreage of legumes in our republic.

On the other hand, the results of the conducted studies allow us to state that in studying the pathology and structure of resistance to these diseases leads to an increase in the effectiveness of the development of the vegetative and economic forms of local forms.

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