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Investigating the distinction, uniformity and stability (DUS) of Negin pinto bean cultivar applying for commercialization

Babak Darvishi[1*] & Hossein Kamari[2]

[1] Assistant professor in Seed and Plant Certification and Registration Institute, Iran

[2] Researcher in Seed and Plant Certification and Registration Institute, Iran

***bdarvishi_84@yahoo.com**

Introduction: Legumes are the second most important source of human food after cereals and the most important source of protein in the world's diet (Rebetzke *et al.*, 2006). High genetic diversity in beans has caused phenotypic diversity in terms of growth habit (limited or unlimited), vegetative characteristics, size, shape and colour of flower, pods and seeds (Vasi *et al.*, 2008). In a research on 89 bean genotypes, it was reported that the characteristics such as number of flowers, number of pods per plant, number of seeds per pod and weight of one hundred seeds were the most effective factors in yield (Keshavarznia *et al.*, 2013). In order to support new plant cultivars and breeders grant rights, it is necessary to compare the candidate cultivar with the existing and known cultivars using morphological traits and, if necessary, molecular traits. New cultivar should have the three conditions of distinction, uniformity and stability in reference traits that to be placed as a new cultivar in the national list of the country's cultivar. This research was carried out in order to evaluate the distinction, uniformity and stability of the distinguishing traits of the new variety of pinto bean (Negin).

Materials and methods: This experiment was conducted in order to investigate the distinction, uniformity and stability of Candidate pinto been cultivar (Negin) along with four control cultivars (Sepehr, Sembol, Saleh and Kusha) based on complete randomized block design with three repetitions during two crop seasons (2021-2022 and 2022-2023) in Khomein region. Morphological traits were observed, measured and recorded on 60 plants or parts of 60 plants according to the international guidelines for distinction, uniformity and stability tests in beans. SAS software (version 9.1) was used for data analysis and mean comparison of studied data was done with Duncan's multi-range test at 5% probability level.

Results and Discussion: Results showed that Negin candidate cultivar, like Sepehr and Sembol, had a climbing growth type, and in this respect, it was completely different from dwarf Saleh and Kusha control varieties. Negin candidate variety in terms of characteristics of average height of the plant, pod curvature, the shape of the end of the pod, the shape and width of the transverse cut of the seed was similar to the control cultivars (Sepehr and Sembol) and it was different from the studied dwarf cultivars (Kusha and Saleh). The results of the composite variance analysis of the studied quantitative traits showed that the effect of the cultivar factor on all the studied quantitative traits was significant (Table 2). The results of mean comparison showed that the length of the tip of the terminal leaflet in Negin (Candidate) and Sepehr cultivars was significantly higher than the other studied cultivars. "Pod length minus tip" of Sembol and Negin (candidate) cultivars were significantly higher than other studied cultivars repectively. "Pod width" in Sembol cultivar was significantly more than other cultivars, so it seems that Sembol cultivar had larger pods (greater length and width). Sepehr cultivar has a thicker pod than other cultivars and it was distinctly different from the other studied cultivars in this respect. In addition to the fact that Sepehr variety had thicker pod. In general, Negin candidate cultivar along with Sepehr and Sembol cultivars are among the climbing cultivars that have bigger seeds than the unlimited growth cultivars (Kusha and Saleh) and their hundred seed weight were significantly higher (Table 3). Bean is a polymorphic crop with diverse growth habit (limited or unlimited), diverse vegetative characteristics, diverse flower colour, size, shape and diverse colour of pods and seeds (Fageria & Santos, 2008). Therefore, the high genetic diversity has created a high phenotypic diversity among the species of this crop plant (Goncalves Ceolin *et al.*, 2007).

Conclusion: Results of distinction, uniformity and stability (DUS) test showed that Negin candidate cultivar was distinguished from other cultivars. Candidate cultivar (Negin) was completely uniform in terms of studied traits in both years of the test and were eligible for registration. Also, the investigated traits in this cultivar was stable in both years of the test.

Keywords: Bean, Cultivar, Distinction, Morphological traits, Stability**,** Uniformity

References

[1] Fageria, N. K. & Santos, A. B. (2008). Yield physiology of dry bean. *Journal of Plant Nutrition*, 31: 983-1004.

[2] Keshavarznia, R., MohammadiNargesi, B. & Abbasi, A. (2013). The study of genetic variation of bean (*Phaseolus vulgaris* L.) based on morphological traits under normal and stress conditions. *Iranian Journal of Field Crops Science*, 44: 305-315. (In Persian)

[3] Rebetzke, G. J., Richards, R. A., Condon, A. G. & Farquhar, G. D. (2006). Inheritance of carbon isotope discrimination in bread wheat (*Triticum aestivum* L.). *Euphytica*, 150: 97-106.

[4] Vasi, M., Gvozdanovi-Varga, J. & Ervenski, J. (2008). Divergence in the dry bean collection by principal component analysis (PCA). *Genetika*, 40: 23 -30.

Table 1. Examination of some qualitative traits of bean cultivars

Qualitative traits have been evaluated	Negin	Sepehr	Sembol	Kusha	Saleh
Plant growth type	Climbing	Climbing	Climbing	Dwarf	Dwarf
plant height (Climbing)	Medium	Medium	Medium	-	-
The shape of the terminal leaflet	Triangular to circular	Circle to rhombus	Circle to rhombus	Circle to rhombus	Circle to rhombus
Inflorescence condition (Climbing)	Above the foliage	In the foliage	In the foliage	-	-
Petal size	Medium to large	Small to medium	Medium	Medium	Medium
Standard flower color	White	Pink	White to pink	White to pink	White to pink
Pod curvature	Very low	Very low	Very low	Low	Medium
The shape of the end of the pod	Sharp tip to imperfect	Sharp tip to imperfect	Sharp tip to imperfect	Sharp tip to imperfect	sharp tip
The curvature of the pod tip	Very low	Low	Medium	Very low	Very low
The shape of the transverse cut of the seed	Elliptical	Elliptical	Elliptical	Circular	Circular
The width of the transverse cut of the seed	Medium	Medium	Medium	wide	wide
Pod background color	Green	Green	Green	Green	Green
Intensity of pod background color	Bright	Medium	Medium	Medium	Medium
The presence of secondary color in the pod	does not have	Medium	Very	Low	Low
Wrinkling of pod in the dry stage	Low	Medium	Medium	Medium	Medium

Table 3. Comparison of the mean of the studied quantitative traits

	Average of studied traits						
Cultivar	The length of the tip of the terminal leaflet (cm)	Pod length minus tip (cm)	Pod width (cm)	Pod thickness (cm)	The length of the pod tip (cm)	Weight of one hundred seed (gr)	Seed length (cm)
Negin	2.11 a	12.33 b	1.33 b	0.700 b	1.43 b	48.50 b	13.83 c
Sepehr	2.06 a	10.83 c	1.40 b	0.966 a	1.75 a	48.00 b	14.83 b
Saleh	1.53 b	10.70 c	1.45 ab	0.733 b	1.10 c	41.50 d	10.00 d
Sembol	1.28 c	16.00 a	1.53 a	0.683 b	1.16 c	55.00 a	16.16 a
Kusha	1.51 b	10.00 c	1.45 ab	0.666 b	1.15 c	42.83 c	9.50 d

Common letters in the levels of each studied factor indicate the absence of significant differences