# Introducing of white bean (*Phaseolus vulgaris* L. cv. 'Hidajdor') new cultivar; Early ripening, large seed with erect growth type

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**Introduction:** Production of beans improved varieties with desirable characteristics such as higher yield, large marketable seeds, tolerant to environmental stresses, erect growth type and suitable for mechanized harvesting are most important goals in introducing of new bean varieties. Therefore it is necessary to provide cultivars to farmers and crop producers that have quantity and quality assurance of the product for their use. Testing value for cultivation and use examines the performance of the candidate varieties, which is compared with the performance of the varieties in the national list of cultivars (Animal & plant agency, 2023). In 2020, the global area under bean cultivation is reported to be about 35 million hectares (FAO, 2020). The area under bean cultivation in Iran in the crop year 2017-2018 was about 108 thousand hectares and the amount of production of this crop was more than 249 thousand tons with an average yield of 2389 kg per hectare (Darvishi *et al.*, 2023). This experiment was conducted in order to investigate the agricultural value of one new variety of white bean named Hidajdor which were introduced by the private sector with the aim of registering the named variety in the national list of plant varieties. Therefore the yield and other important agronomic characteristics of this cultivar should be compared with the cultivars in the national list of plant cultivars based on the characteristics mentioned in the bean value for cultivation and use test instructions.

**Materials and methods:** Candidate white been cultivar (Hidajdor) along with 4 domestic control cultivars (Almas, Dorsa, Pak and Shokufa) were studied in 3 locations (Karaj, Zanjan and Khomein) based on complete randomized block design in 3 replications during two crop seasons (2019-2020 and 2020-2021). Important agricultural characteristics such as length of flowering period, length of ripening period, height of first pod, number of seeds per plant, hundred seeds weight and seed yield were studied on the instructions of bean value for cultivation and use test. 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:** Variance analysis showed that cultivar factor had significant effect on studied characteristics consist of length of flowering period, length of ripening period, height of first pod, number of seeds per plant, hundred seeds weight and seed yield (Table 1). Flowering occurred significantly earlier in candidate cultivar (Hidajdor) than control cultivars (6 days earlier) (Table 2). As the same way, physiological seed ripening in candidate cultivar occurred earlier than control cultivars (4 days earlier than mean of other cultivars) (Table 2). In Candidate Hidajdor variety, despite the lower height of the plant compared to control cultivars, the height of the first pod was higher than control cultivars (Table 2). Although the number of seeds in the plant of Hidajdor candidate cultivar was lower than control cultivars, but this variety produced bigger seeds so that the average weight of hundred seeds of this variety (46.72 grams) was significantly higher than the control cultivars (29.05 grams) (Table 2). Also, in early flowering cultivars, the seed filling period will be longer (Shoonhoven & Voysest, 1991). This feature has caused early flowering cultivar (Hidajdor) to have higher hundred seed weight despite having a lower yield. It has been reported that the weight of hundred seeds weight and the number of seeds in pods are influenced by genotype in bean plants and the studied cultivars can behave differently in terms of these traits (Faraji *et al.*, 2010) .

**Conclusion:** Finally, the candidate cultivar Hidajdor can play an effective role as new germplasm in the country's bean production due to its erect growth type and ease of harvesting, early maturity and consumption of one to two times less water, marketability and production of larger seeds. Early flowering is considered as an important advantage in the formation of yield of bean cultivars. This feature makes the flowering process start earlier in early flowering cultivars before the onset of environmental stresses such as drought and high temperature.

**Keywords:** Earliness, Growth type, Hundred seed weight, Seed yield

**References**

[1] Animal and Plant Health Agency. (2023). *VCU protocols and procedures for testing agricultural crops*. Retrieved February, 12, 2023, from https://www.gov.uk/guidance/vcu-protocols-and-procedures-for-testing-agricultural-crops

[2] Darvishi, B., Shakeri, M., Nasiri Vatan, H., Kavand, M. & Yenkeje Farahani, Sh. (2023). Investigating the Agronomic Value of One White Bean Cultivar Applying for Commercialization. *Iranian Journal of Field Crop Science,* 54 (3): 53-67. (In Persian)

[3] Faraji, H., Gholizadeh, S., Owliaiee, H. R. & Azimi Gandomani, M. (2010). Effect of plant density on grain yield of three spotted bean (*Phaseolus vulgaris* L.) cultivars in Yasouj condition. *Iranian Journal of Pulses Research*, 1, 43-50. (In Farsi)

[4] Schoonhoven, A., Vosyest, O., (1991). *Common beans: Research for crop improvement for the 21st century*. Kluwer Academic Publication. Dordrecht, Germany.

Table 1. Summary of mean square variance analysis of studied traits in white bean cultivars

| SOV | DF | Length of flowering period | Length of ripening period | Height of first pod | Number of seeds per plant | Hundred seeds weight | Seed yield |
|---|---|---|---|---|---|---|---|
| Year | 1 | 378.45** | 15.022* | 371.06** | 7835.91 ns | 15.38 ns | 46466.08** |
| Location | 2 | 123.40** | 367.31** | 151.27** | 288235.98** | 59.18** | 56826.07** |
| Location ×Year | 2 | 215.45** | 59.20** | 162.95** | 226.09 ns | 0.52 ns | 5727.37 ns |
| R (L × Y) | 6 | 4.14 | 2.03 | 11.29 | 411.53 | 1.16 | 5444.36 |
| Cultivar | 4 | 218.89** | 81.76** | 110.21** | 16833.62** | 1512.39** | 14695.41 ns |
| Cultivar×Year | 4 | 10.93** | 35.23** | 75.04** | 6022.95 ns | 7.25 ns | 3390.69 ns |
| Cultivar×Location | 8 | 29.52** | 120.80** | 36.23** | 12238.59** | 37.81** | 9314.37 ns |
| C × L × Y | 8 | 3.19 ns | 10.91** | 75.73** | 11458.32** | 3.92 ns | 14071.98* |
| Error | 84 | 2.14 | 2.24 | 6.15 | 3334.08 | 5.80 | 6199.59 |
| CV(%) | - | 2.66 | 1.56 | 16.30 | 25.91 | 7.38 | 20.70 |

ns, * and **: not significant and significant at the 0.05 and 0.01 of probability levels, respectively. DF: Degree of freedom, Y: Year, L: Location, R: Replication and C: Cultivar.

Table 2. Mean comparison of white bean traits in levels of studied factors

| Studied factors | Level | Mean of studied traits | | | | | |
|---|---|---|---|---|---|---|---|
| | | Length of flowering period (day) | Length of ripening period (day) | Height of first pod (cm) | Number of pods per plant | Hundred seeds weight (gr) | Seed yield (kg.ha$^{-1}$) |
| Year | 1 | 58.92 a | 95.86 b | 11.40 b | 19.05 a | 33.51 a | 4271.8 a |
| | 2 | 51.17 b | 97.76 a | 19.02 a | 13.70 b | 31.72 b | 3333.8 b |
| Location | Karaj | 59.20 a | 94.67 b | 17.05 a | 19.12 a | 31.85 b | 4877.2 a |
| | Khomein | 55.43 b | 105.37 a | 17.85 a | 12.81 c | 30.15 c | 3905.1 b |
| | Zanjan | 50.50 c | 90.40 c | 10.74 b | 17.21 b | 35.86 a | 2626.2 c |
| Cultivar | Almas | 58.92 a | 98.29 a | 14.56 b | 18.98 a | 28.14 c | 4186.2 a |
| | Dorsa | 54.75 d | 95.25 c | 13.23 b | 16.27 b | 30.59 b | 3714.6 b |
| | Hidajdor | 50.13 e | 94.50 c | 17.58 a | 14.35 c | 46.72 a | 3732.5 b |
| | Pak | 56.85 b | 98.62 a | 13.29 b | 17.81 b | 28.43 c | 3864.0 b |
| | Shokufa | 55.63 c | 97.41 b | 17.39 a | 14.48 c | 29.22 bc | 3517.0 b |

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