



# Testing value for cultivation and use of pinto bean (*Phaseolus vulgaris* L. cv. ‘Negin’) cultivar applying for commercialization

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**Introduction:** High-potential cultivars play an important role in increasing yield and productivity, as a result, in the development of the country's agricultural economy. 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). The aim of the current research is to evaluate the value for cultivation and use of a pinto bean variety applying for commercialization in the most important bean growing climates in Iran, 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:** In this experiment, Candidate pinto bean cultivar (Negin) along with 4 control cultivars (Sembol, Sepehr, Saleh and Kusha) were studied in 3 locations (Khomein, Ardabil and Isfahan) based on complete randomized block design in 4 replications during two crop seasons (2021-2022 and 2022-2023). Important agricultural characteristics such as length of flowering period, plant height, number of pods per plant, number of seeds per pod and length of physiological ripening period during the plant growth period 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. Figures were also drawn using Excel software.

**Results and Discussion:** Results showed that flowering occurred significantly earlier in Negin candidate cultivar (42.3 days) than control cultivars. Seed ripening in Negin candidate cultivar happened 5 days earlier than determinate control cultivars (mean ripening period 82.1 days) and 12 days earlier than undeterminate control cultivars (mean ripening period 89.5 days). In all three studied locations, Sembol determinate cultivar had the highest hundred seed weight (52.98 g) and after that the other determinate cultivars (Negin and Sepehr) had the highest hundred seed weight (48.92 g and 46.53 g respectively). Seed yield of determinate candidate cultivar (4235.8 kg/ha) was significantly more than other determinate Sepehr and Sembol cultivars (4027.1 kg/ha and 3446.8 kg/ha respectively) and seed yield of Negin cultivar had not significant difference with seed yield of undeterminate Saleh cultivar (Table 2). Comparison of average seed yield in cultivar  $\times$  location interaction showed that average seed yield of undeterminate Kusha and Saleh cultivars in Isfahan and Ardabil was significantly higher than the other studied cultivars, while in Khomein region seed yield of candidate Negin cultivar was significantly higher than other undeterminate (Kusha and Saleh) and determinate (Sembol and Sepehr) cultivars (Figure 1). Also, results showed that the highest amount of plant height, the height of the first pod and the number of seeds in the pod belonged to the Kusha variety and the highest amount of pod number per plant belonged to the Sembol variety (Table 2). Sabokdast and Khyalparast (2008) studied 30 bean cultivars and reported the existence of genetic diversity among bean cultivars. Early flowering is considered as an important advantage in the formation of yield of bean cultivars. In early flowering cultivars (Such as Negin), flowering starts before the onset of stresses such as drought and high temperature. Also, in these cultivars, the senescence period will be longer (Shoonhoven & Voysest, 1991). This feature has caused early flowering cultivars (Sambal, Sepehr and Negin) to have higher hundred seed weight despite having a lower yield (Table 2).

**Conclusion:** Finally, Negin candidate cultivar can play an effective role as new germplasm in the Iran's bean production due to its erect type and ease of harvesting, early maturity and consumption of one to two times less water, marketability and production of larger seeds.

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

## References

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Table 2. Mean comparison of pinto bean traits in the levels of studied factors (Duncan's test)

|                 |         | Average of studied traits |                       |                   |                       |                |                        |                      |                                   |
|-----------------|---------|---------------------------|-----------------------|-------------------|-----------------------|----------------|------------------------|----------------------|-----------------------------------|
| Studied factors | Level   | Days to flowering (day)   | Maturity period (day) | Plant height (cm) | First pod height (cm) | Number of pods | Number of seeds in pod | 100 seed weight (gr) | Seed yield (kg ha <sup>-1</sup> ) |
| Year            | First   | 48.78 a                   | 85.47 a               | 50.73 a           | 12.22 a               | 13.16 a        | 4.47 a                 | 48.07 a              | 4149.78 b                         |
|                 | Second  | 47.60 a                   | 82.75 b               | 44.76 b           | 12.43 a               | 13.87 a        | 4.48 a                 | 45.99 b              | 4182.30 a                         |
| Location        | Karaj   | 53.32 a                   | 83.65 a               | 50.47 a           | 9.45 c                | 16.92 a        | 4.91 a                 | 48.53 a              | 4723.35 a                         |
|                 | Khomein | 47.77 b                   | 84.57 a               | 45.01 a           | 15.26 a               | 10.10 c        | 4.47 b                 | 45.46 c              | 3608.73 c                         |
|                 | Isfahan | 41.97 c                   | 84.11 a               | 47.74 a           | 12.27 b               | 13.52 b        | 4.03 c                 | 47.10 b              | 4166.04 b                         |
| Cultivar        | Kusha   | 54.68 a                   | 90.93 a               | 64.23 a           | 14.22 a               | 12.87 bc       | 4.92 a                 | 43.03 d              | 4706.7 a                          |
|                 | Saleh   | 51.56 b                   | 88.18 b               | 61.78 a           | 12.26 b               | 13.70 b        | 4.49 b                 | 43.68 d              | 4413.9 b                          |
|                 | Sembol  | 46.08 c                   | 83.81 c               | 36.56 c           | 12.16 b               | 16.91 a        | 3.87 c                 | 52.98 a              | 3446.8 d                          |
|                 | Sepehr  | 43.79 d                   | 80.50 d               | 35.14 c           | 11.48 b               | 11.44 c        | 4.57 b                 | 48.92 b              | 4027.1 c                          |
|                 | Negin   | 42.33 e                   | 77.12 e               | 40.72 b           | 11.50 b               | 12.65 bc       | 4.51 b                 | 46.53 c              | 4235.8 bc                         |

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

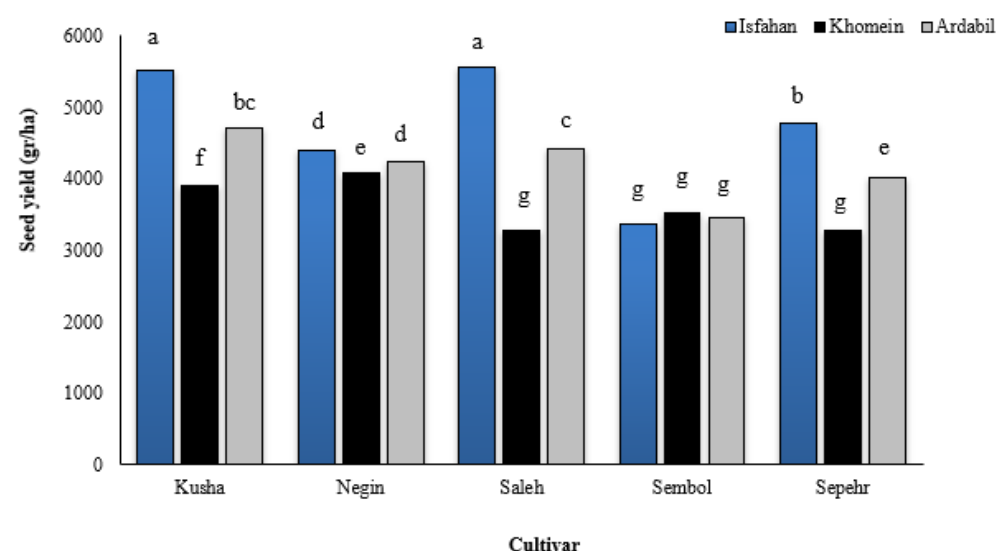


Figure 1: Mean comparison of seed yield of bean cultivars in location  $\times$  cultivar interaction. Common letters in the columns indicate nonsignificant differences at the 5% probability level