



In Iran's semi-arid regions, planting primed seeds is an efficient way to provide fodder during severe climatic conditions



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Introduction

Due to the problems caused by the effects of climate change and excessive exploitation in the past, Iran's rangelands cannot provide animal fodder. Studies show that, in many regions of Iran, especially in arid and semi-arid regions, poor seed establishment is one of the common causes of low fodder plant yields. However, the need to use various techniques for improving and restoring rangeland species is now increasingly apparent due to the fact that a sizeable portion of ranchers in Iran's arid and semi-arid regions depend on rangeland feed.

Astragalus squarrosus Bunge is one of the native and adapted species in the sand fields of Iran, which is of great importance in terms of tolerance to severe climatic conditions and the value of fodder production for livestock, especially camels. Many of forage and medicinal species in Iran have wild growth type and as a result, they have seed dormancy. The main problem in wild species is the lack of knowledge about how to break their seed dormancy and improve their germination. For several years, efforts have been made to use pretreatments to improve the percentage and speed of seed germination in the field. Seed priming is known as a method which improves the seed germination performance. In order to make optimal use of rangeland resources, rehabilitation and improvement of winter rangelands in semi-arid regions are inevitable. One of the methods for rangeland improvement is the seed sowing with native species as *Astragalus* species. The genus *Astragalus* belongs to the Fabaceae family and are of great medicinal, forage and industrial values in Iran. *Astragalus* is the largest genus of vascular plants with about 3000 annual and perennial species classified in 205 sections. *Astragalus squarrosus* Bunge is a desert perennial shrub. This plant has no thorns and is palatable plant in dry areas of central, south-east to north-east of Iran with wide distribution.

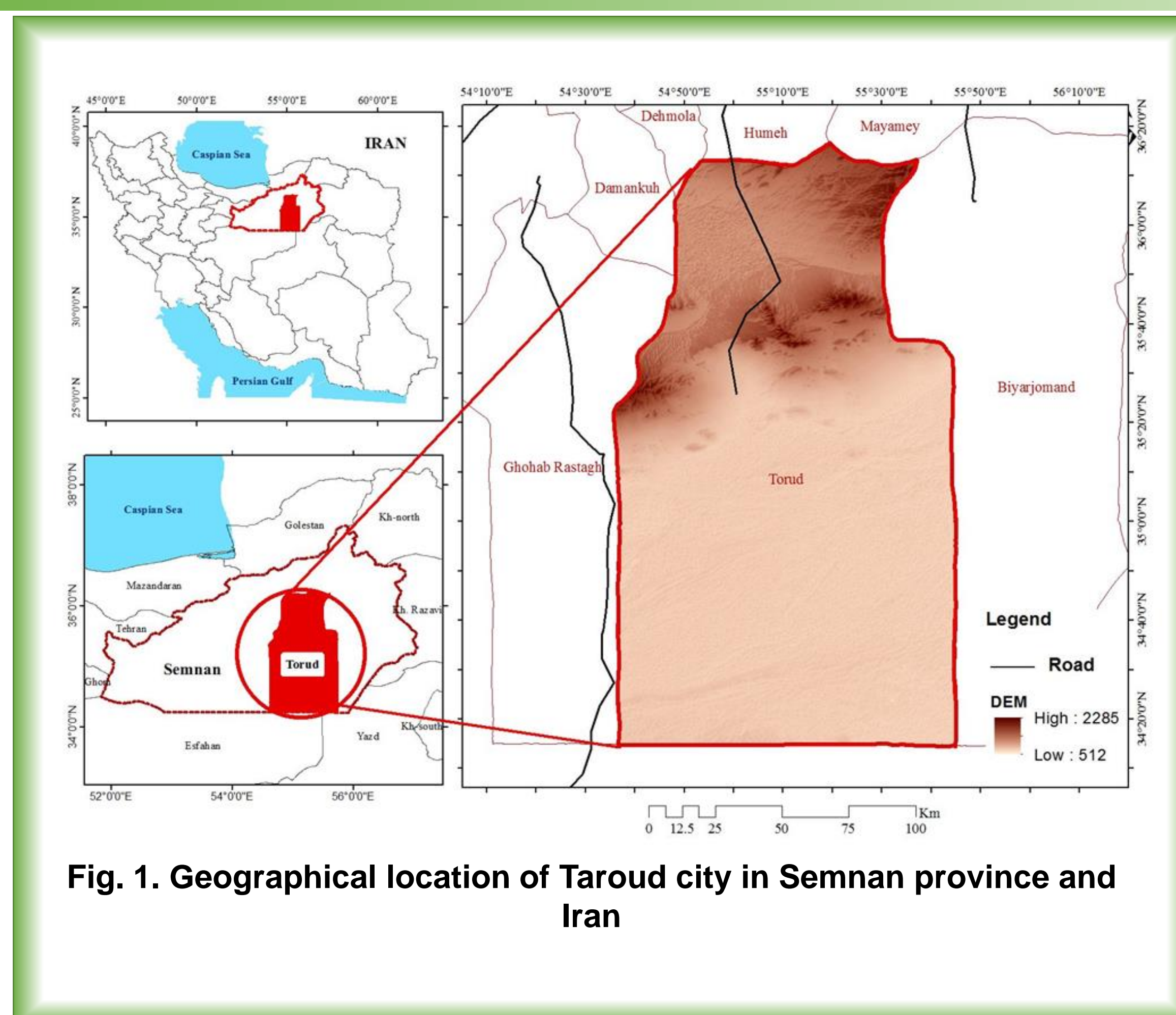


Fig. 1. Geographical location of Torud city in Semnan province and Iran

Materials and Methods

In order to investigate the effects of priming on seed germination and seedling growth, the experiment was conducted in split plots based on a randomized complete block design with five replications at Torud Research Farm in Semnan Province, Iran. This research was done on three ecotypes of *Astragalus squarrosus* Bunge and by nine treatments. The distilled water was considered as the control treatment. So, seeds of different ecotypes, including Yazd, Kashan, and Semnan ecotypes of *Astragalus squarrosus* Bunge, were primed separately under different treatments, including hydropriming, hormone priming (gibberellin hormone: 125 ppm, salicylic hormone: 100 and 200 mg/l, ascorbic hormone: 100 and 200 mM and osmopriming by potassium nitrate: 0.3 and 0.2%). This research was carried out as a split plot design based on a completely randomized block design with 5 replications. Thus, the main plot was related to three different *A. Squarrosus* ecotypes including Semnan, Yazd and Kashan and sub-plots related to priming treatments.



Fig. 2. Influence of seed priming treatments on plant height of *Astragalus squarrosus* Means with the same letter are not significantly different at 5% probability level based on Duncan test



Astragalus squarrosus at Torud area in Semnan province, Iran.

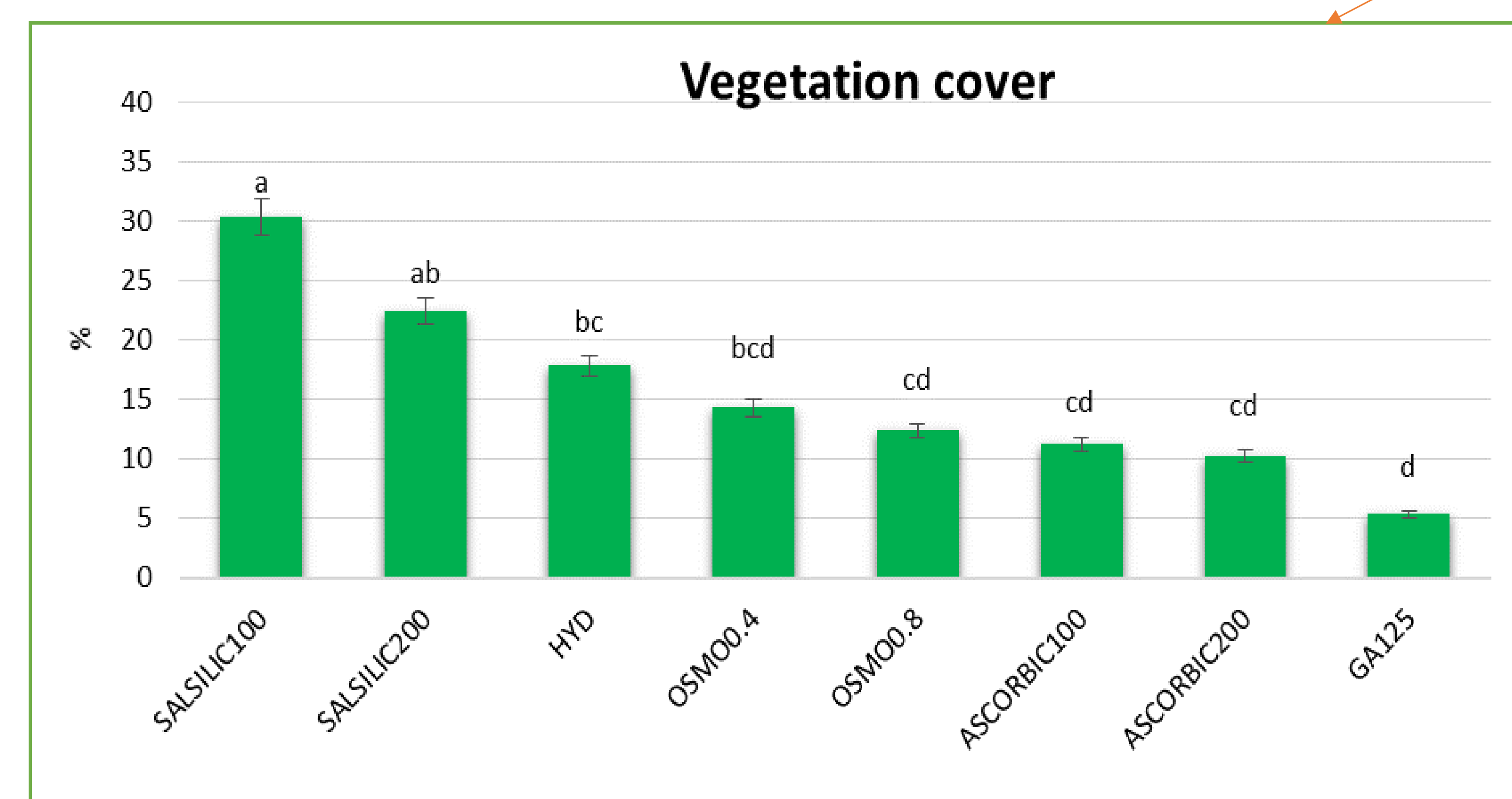


Fig. 3. Influence of seed priming treatments on vegetation cover of *Astragalus squarrosus* Means with the same letter are not significantly different at 5% probability level based on Duncan test.

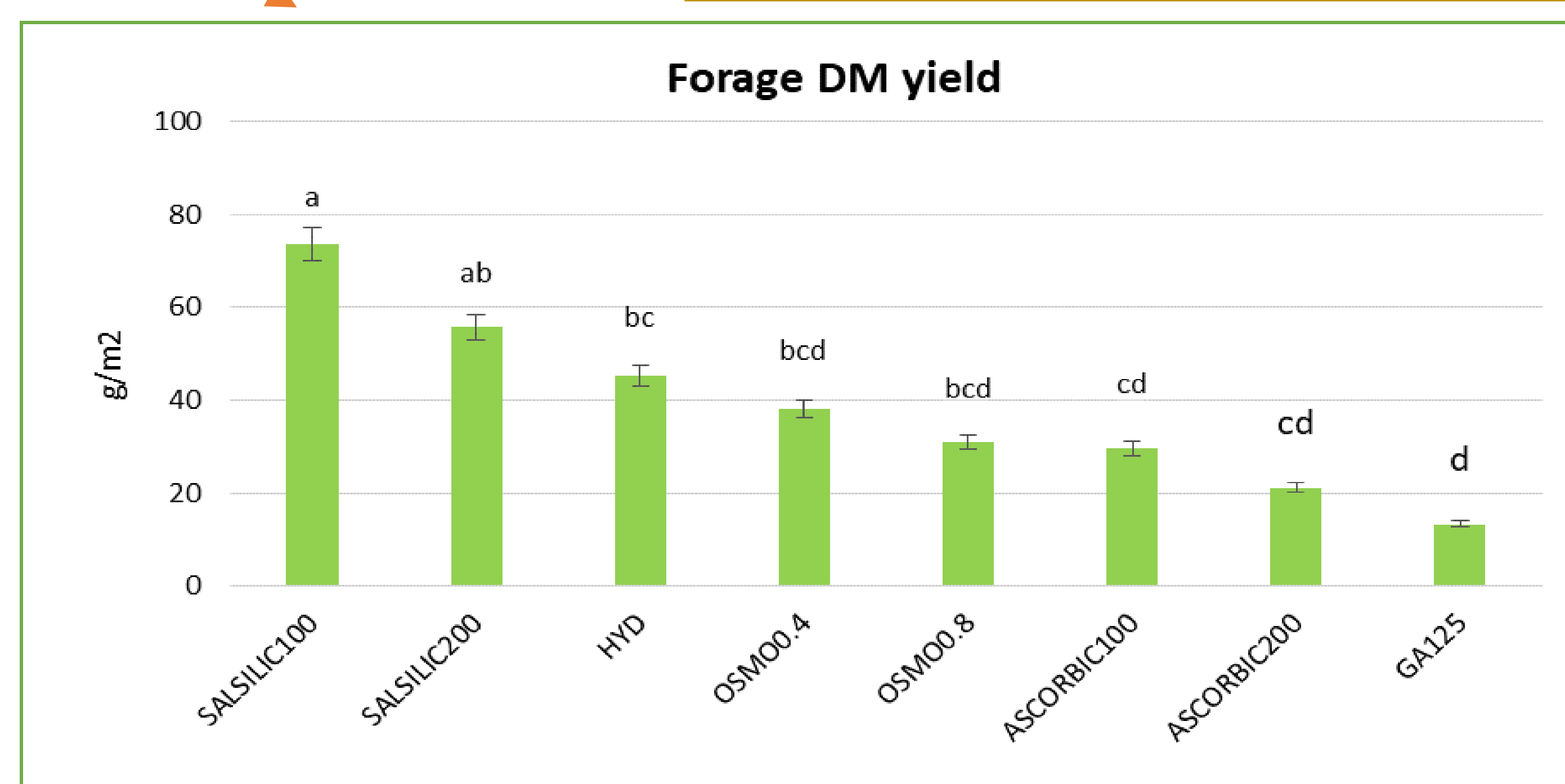


Fig. 4. Influence of seed priming treatments on forage DM yield of *Astragalus squarrosus* Means with the same letter are not significantly different at 5% probability level based on Duncan test

Conclusions

The results showed that the effect of different treatments on qualitative and quantitative traits of *Astragalus squarrosus* was different in three ecotypes of Yazd, Kashan and Semnan. Among the treatments, salicylic acid 100 and 200 (mg/l) had a higher effect on quantitative and qualitative traits in all three ecotypes. In this regard, Salicylic acid activates many protective enzymes such as catalase, superoxide dismutase and ascorbate peroxidase. Also, this acid causes cell elongation and cell division, which is done in cooperation with other regulators, including auxin, and regulates cell proliferation, division and death, and increases the total weight of the plant. Salicylic acid is a plant hormone known to reduce the harmful effects of many stresses. Salicylic acid and its derivatives are among the new compounds that act as phytohormones in some plants. Salicylic acid is a prophetic and an inductive molecule in plant defense and thus increases plant resistance to pathogens. Researchers have shown that salicylic acid has improved a number of abiotic stresses such as heat stress and reduced freezing damage in various plants and increased resistance to heavy metal stress in plants. Salicylic acid is effective in bud growth, membrane permeability, mitochondrial respiration, stomata closure, photosynthetic material transfer, and ion uptake rate. According to the findings of the current study, priming significantly affected *Astragalus squarrosus* Bunge seed germination and yield. The Yazd ecotype under salicylic acid hormone 100 (mg/l) had the maximum performance in terms of yield and seed germination. In general, seed priming improves the yield and fodder production of *Astragalus squarrosus* Bunge. Therefore, further research under farmer conditions in Iran's semi-arid regions is necessary.