

# Nutritional profile of Kabuli and Desi chickpeas (*Cicer arietinum*) and their differential responses to low water provision

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## Overview

Exploring the nutritional profile of distinct chickpea varieties and their tolerance to low water provision is key to supporting human nutrition while ensuring agricultural sustainability and resilience to climate change. The traditional Desi black chickpea shows higher resilience to low water supply than a commercial Kabuli white chickpea, having the potential to promote the sustainability of agroecosystems and food security under the predicted scenarios of more frequent drought events.

## Introduction

**Legumes** are of great importance for agriculture and the environment due to their ability to fix atmospheric nitrogen and provide **important nutrients**. The promotion of legume cultivation, such as chickpeas, and the recovery of under-exploited traditional legume varieties could contribute to fostering **biodiversity**, promoting environmental **sustainability** and **diversifying diets**, which is of particular importance under climate change. However, the exploitation of traditional varieties, such as the **Desi chickpea** (black-coloured) as a source of key nutrients and resilience to environmental pressures, such as **water scarcity**, has been overlooked. Thus, the aim of this work was to compare the **nutritional profile** and **tolerance degree to water scarcity** of a commercial Kabuli (white) chickpea and a traditional Desi (black) chickpea.

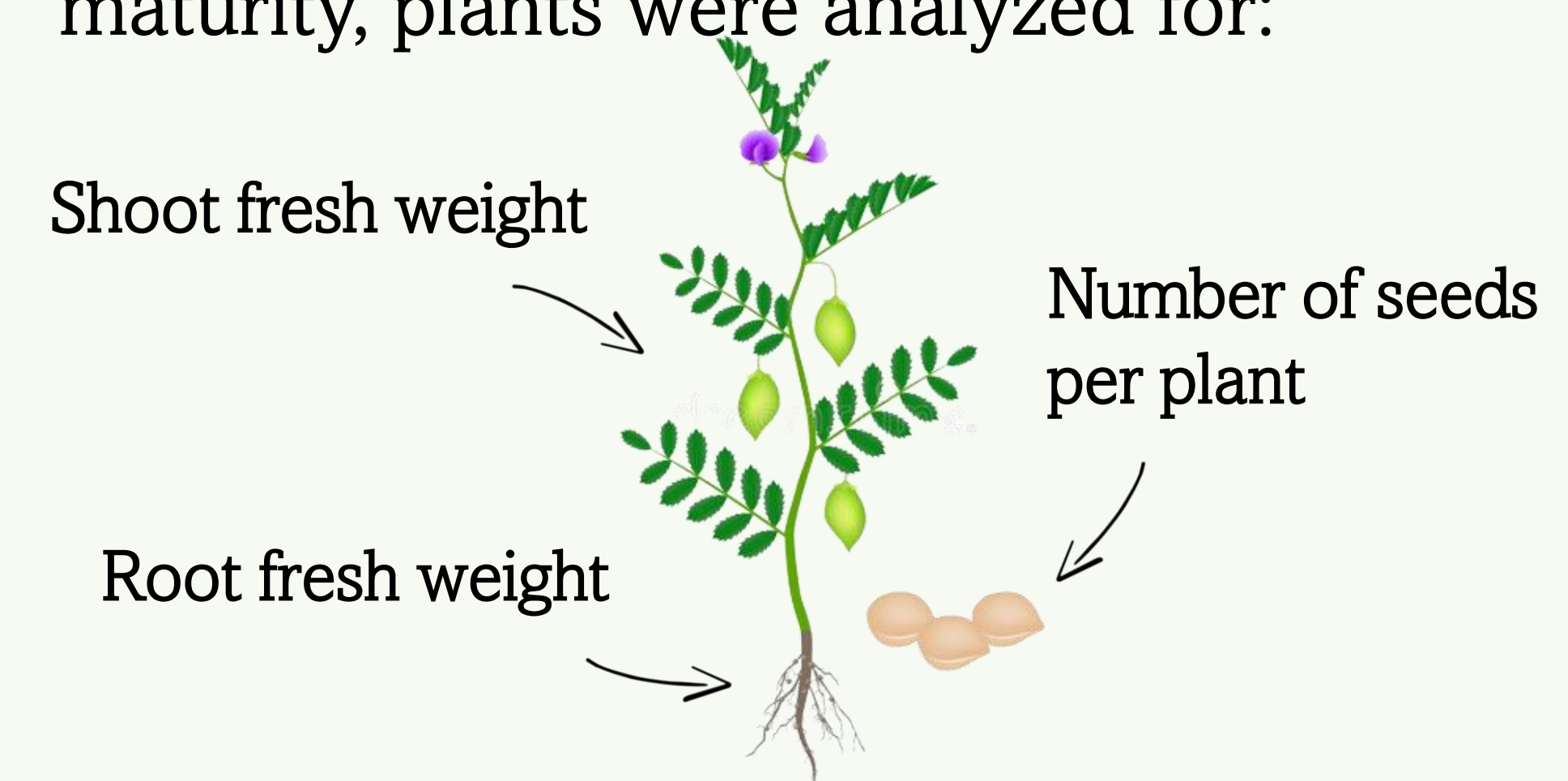
## Methods

- ✓ Seeds of a **Kabuli (white)** and a **Desi (black)** chickpea were analyzed for their nutritional profile:



Minerals: magnesium, iron, zinc, boron - ICP-OES  
Protein - Dumas Nitrogen Analyzer  
Antioxidants - Folin-Ciocalteu

- ✓ Seeds were also germinated and grown under distinct water levels: **90%, 50% or 25% of the field capacity**. At plant maturity, plants were analyzed for:



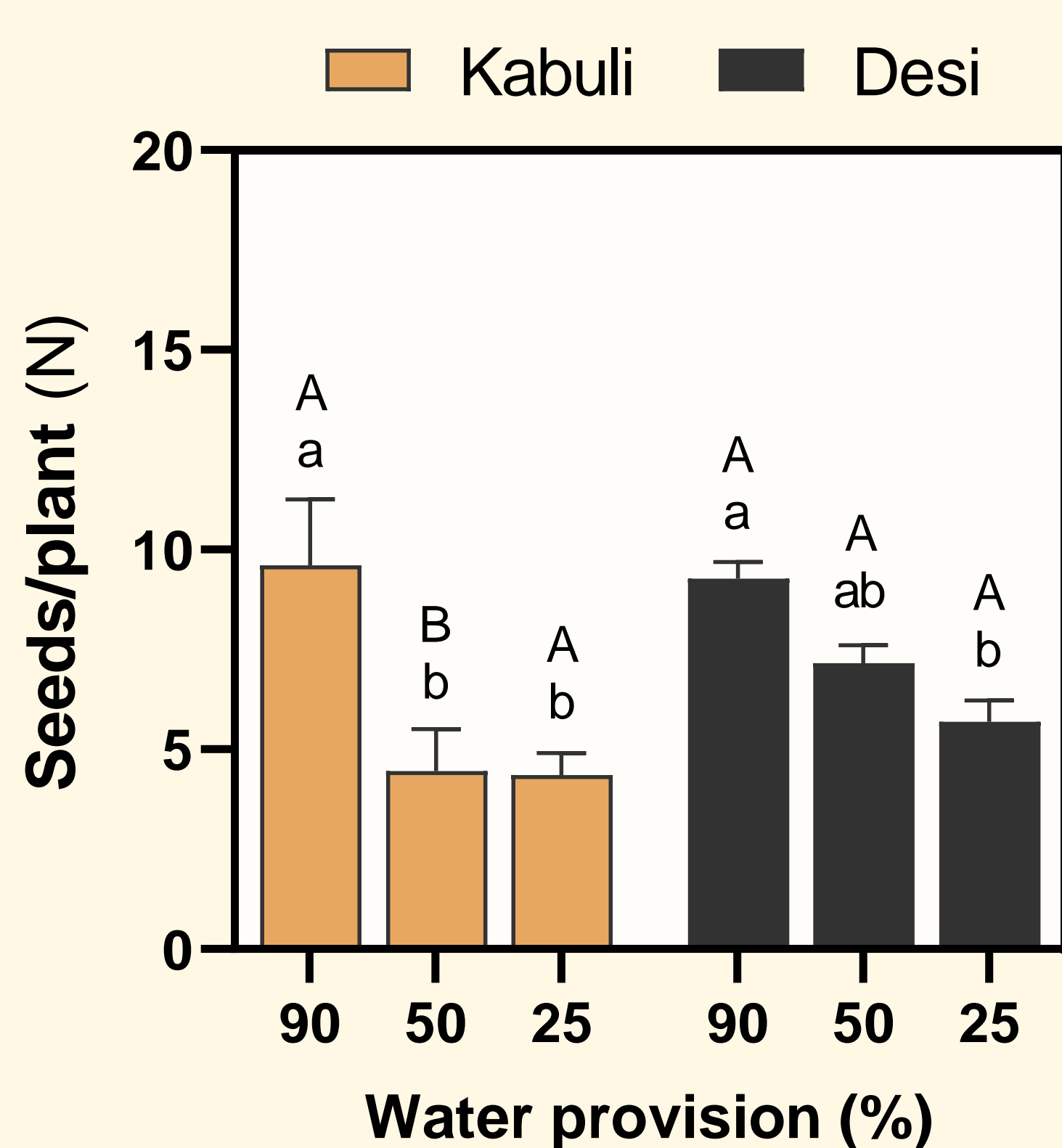
## Results & Discussion

### SEED NUTRITIONAL PROFILE

- ▶ Both chickpea types had **significant amounts** of several macro- and micro-nutrients important for **human nutrition**.
- ▶ The Kabuli chickpea was richer in **boron** (by 30%), while the Desi black chickpea had a higher level of **antioxidant compounds** (by 32%).

**Table 1.** Nutritional profile of Kabuli (white) and Desi (black) genotypes. Values represent the mean  $\pm$  SEM and letters indicate statistically different means at  $p < 0.05$ .

	Kabuli	Desi
<b>Magnesium</b> (mg.g <sup>-1</sup> )	0.62 $\pm$ 0.01	0.71 $\pm$ 0.04
<b>Iron</b> ( $\mu$ g.g <sup>-1</sup> )	21.1 $\pm$ 0.25	24.2 $\pm$ 1.35
<b>Zinc</b> ( $\mu$ g.g <sup>-1</sup> )	16.5 $\pm$ 0.64	17.8 $\pm$ 0.78
<b>Boron</b> ( $\mu$ g.g <sup>-1</sup> )	3.13 $\pm$ 0.15 <sup>a</sup>	2.35 $\pm$ 0.20 <sup>b</sup>
<b>Protein</b> (%)	15.8 $\pm$ 0.05	16.0 $\pm$ 0.23
<b>Antioxidants</b> (%)	0.64 $\pm$ 0.01 <sup>b</sup>	0.85 $\pm$ 0.02 <sup>a</sup>

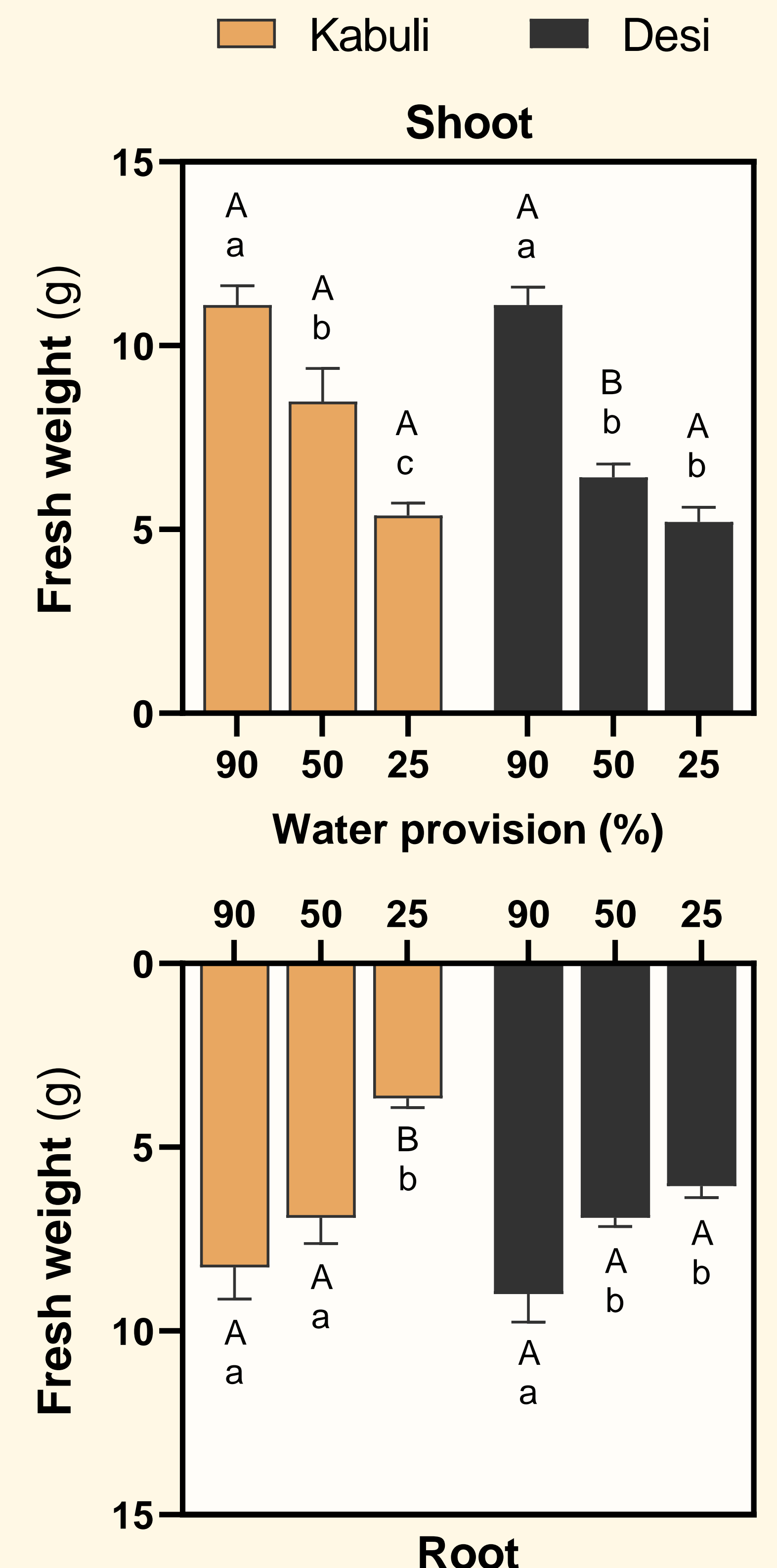


### SEED NUMBER

- ▶ The **number of seeds** per plant **decreased** in Kabuli and Desi **with decreasing water provisions** (up to 55 and 39%, respectively).
- ▶ Still, at **moderate water supply** (50%), **Desi** produced a **higher number of seeds** per plant (by 60%) than Kabuli.

### PLANT FRESH WEIGHT

- ▶ Low water provision (25%) **decreased** root and shoot **fresh weight** in Kabuli and Desi (up to 55%), compared with 90% water supply.
- ▶ Yet, in **Desi**, a 165% **higher root fresh weight** was observed at lower water supplies (as compared with Kabuli), likely as a sign of higher resilience.



**Figures.** Root and shoot fresh weight and number of seeds per plant of Kabuli and Desi chickpeas grown under distinct water supplies. Values represent the mean  $\pm$  sem. Upper case letters indicate statistically different means between chickpea types subjected to the same water provision, while lower case letters indicate statistical differences between water provisions within each type ( $p < 0.05$ ).

## Conclusions

- Kabuli chickpeas have higher boron concentration, while Desi is richer in antioxidants, highlighting the intraspecific differences in the chickpea nutritional profile.
- Desi demonstrated higher resilience to lower water supplies through biomass allocation to roots and maintenance of seed production at lower water provisions.

## Acknowledgments

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