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# Mediterranean lupines as an alternative protein source to soybean

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# Introduction

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**Soybean is the most commonly used protein supplement of plant origin in animal diets. However, its high price and environmental impacts of production and transport to global markets stimulate producer's interest in alternative use of locally produced feed ingredients including grain legumes. Lupin is one of the major grain legumes economically cultivated in Europe.**

**Their seeds are characterized by high protein and dietary fiber content, presenting a high nutritional value for animal feeding. There is the need for screening new alternatives that can replace soybean by traditional protein sources with nutritional and commercial value for human and animal consumption.**

**The aim of this study was to evaluate the effects of sowing date on the potential of 3 lupines varieties well adapted to Mediterranean climatic conditions and soils from North Portugal as an alternative protein source to human and animal feed.**





# Material and methods

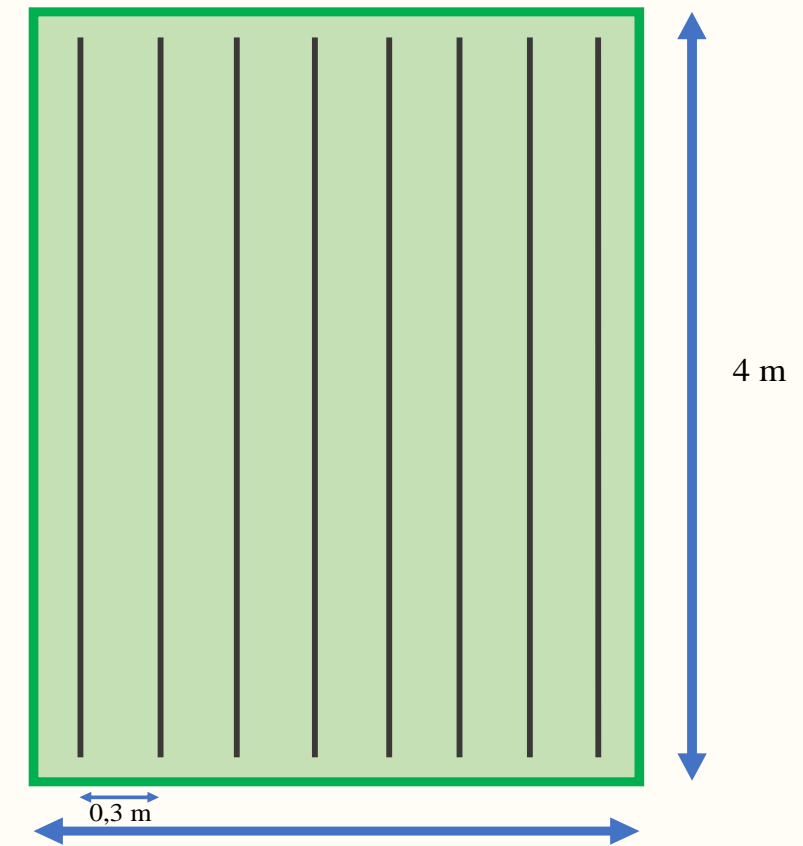
- **Location**

- North of Portugal: Vila Real (VR)

- **Three lupines varieties**

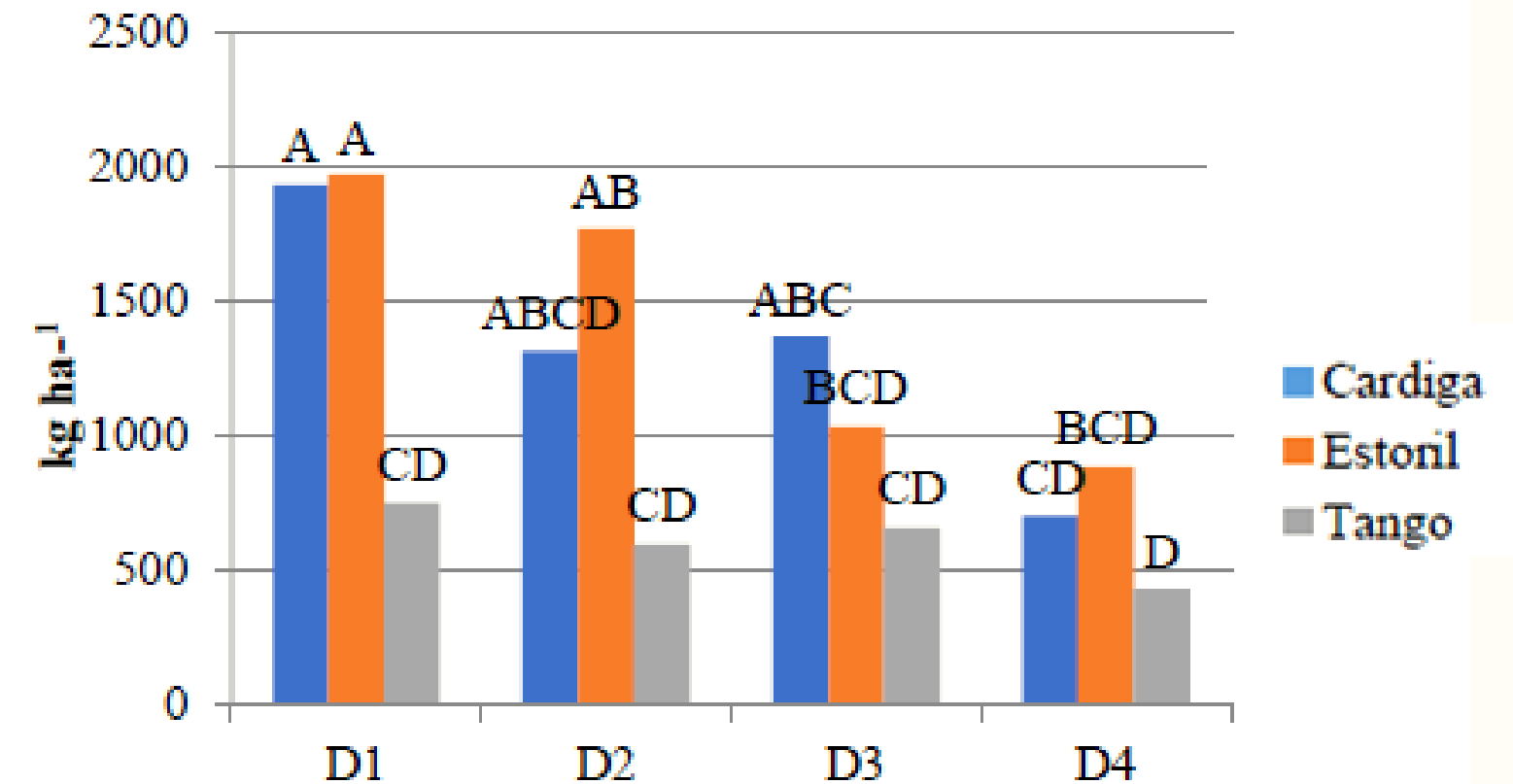
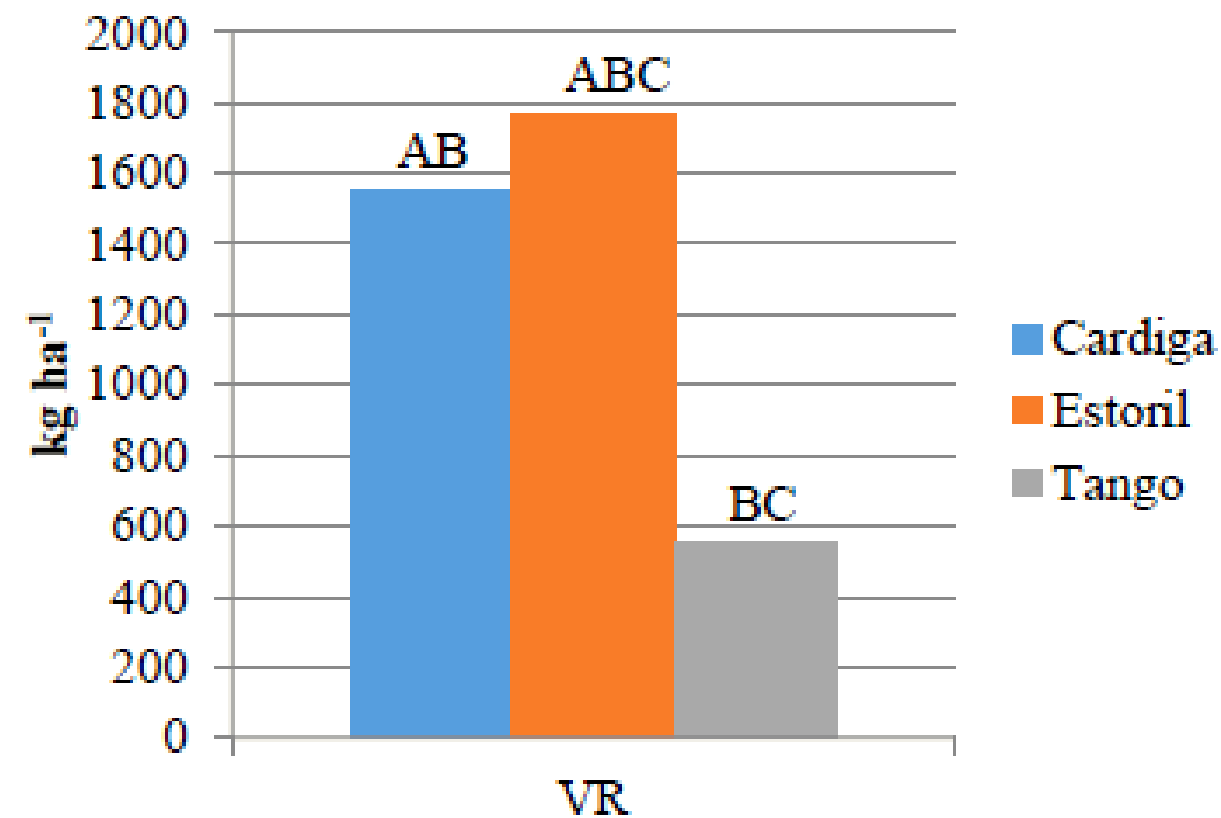
- White lupine (*Lupinus albus* L.) cv. Estoril
- Narrow-leaved lupine (*Lupinus angustifolius* L.) cv. Tango
- Yellow lupine (*Lupinus luteus* L.) cv. Cardiga

- **Four sowing dates** with 3-weeks interval were tested from early September to November
- **Four replications** (split-plot complete randomized block design with plots of 10m<sup>2</sup>)
- **The harvest** was carried out during the month of **June**
- **Agronomic parameters** (plant growth indicators, weed infestation, grain yield and protein content) were evaluated



# Results

- **Grain Production**



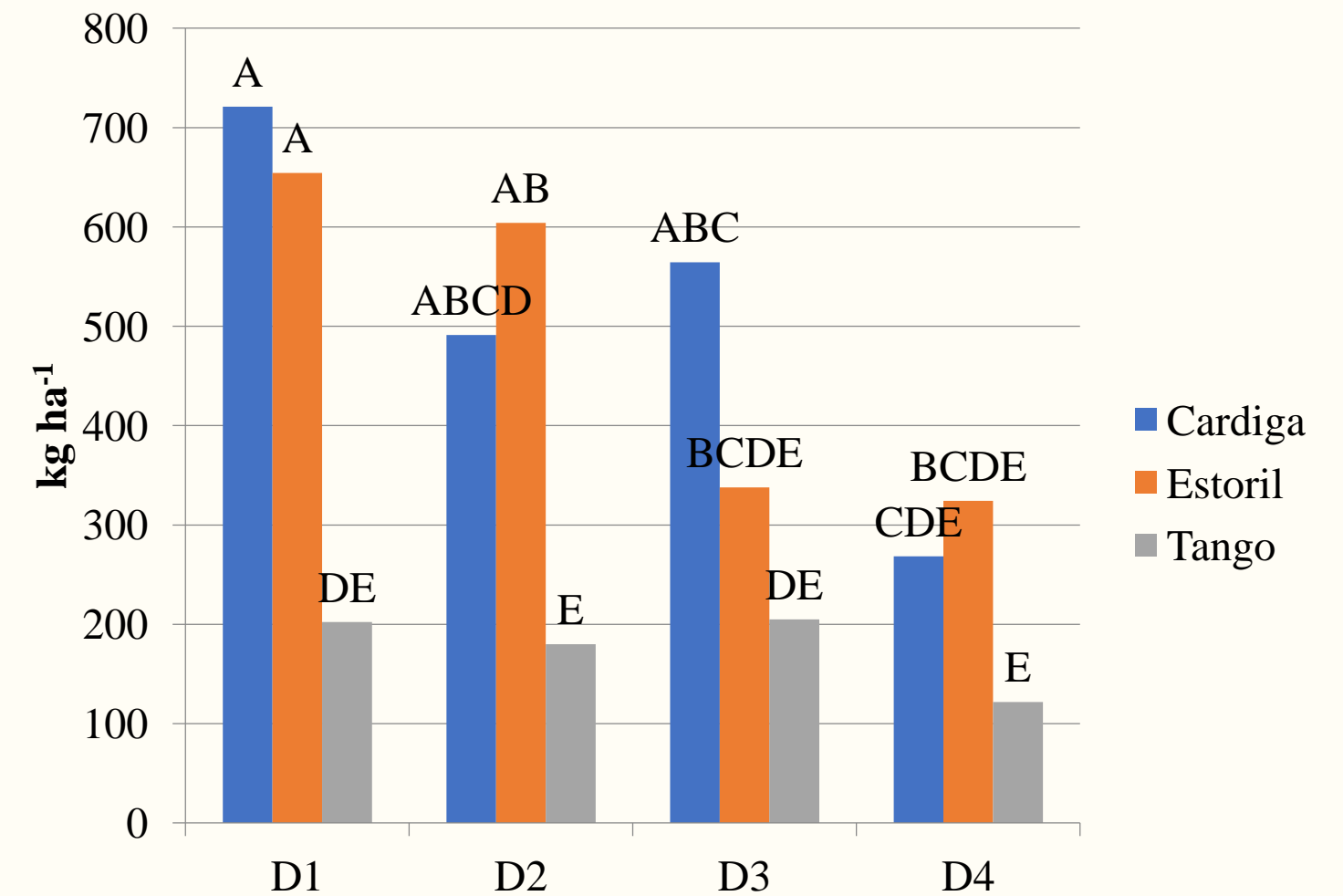
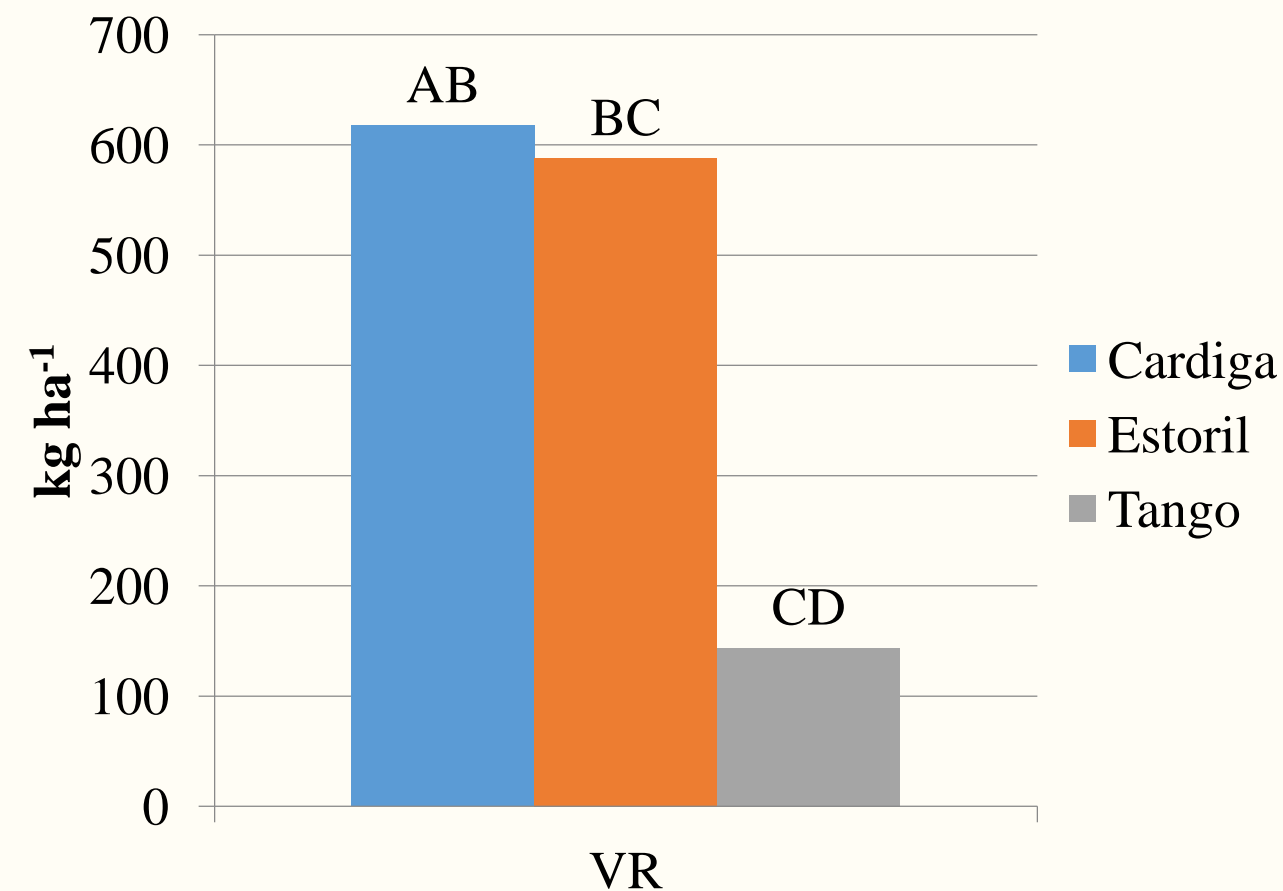
Early sowing of Estoril yield more grain than Cardiga (1766 and 1552 kg ha<sup>-1</sup>, respectively). Late sowing dates significantly reduced (59-62%) yields compared to early sowing. In contrast, Tango showed always the lowest grain yield in all sowing dates with a reduction of 91% and highest weed infestation in the last date compared to first one.





# Results

- Grain protein yield**



**The highest grain protein yield was obtained with Cardiga (618 kg ha<sup>-1</sup>) and Estoril (588 kg ha<sup>-1</sup>), while the lowest in Tango (144 kg ha<sup>-1</sup>).**

**The grain protein yield decreased from first to last sowing date, with a reduction to half in Estoril and Tango and Cardiga showing 59% less, in last sowing.**



# Conclusions

- **Sowing of any of the three studied varieties should be carried out as soon as possible after the first rainfall.**
- **Later sowing dates affected grain and protein production, in particular of *L. albus* (cv. Estoril) and *L. luteus* (cv. Cardiga).**
- **High temperatures in the months of April and May, as well as below-normal rainfall in the month of May, negatively affected production.**
- **Cardiga following by Estoril showed more adaptability to the region and may constitute an alternative protein source for feed industry.**

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