

SPAIN

MECHANICAL WEEDING IN ORGANIC LENTIL CROP

PEDO-CLIMATIC CONDITIONS:

Spain has a very diverse climate. The farm on which the Smart Protein experimental crops were grown is located in the south of the Navarra region, where the climatic conditions vary between Mediterranean and steppe. Rain is scarce and irregular, with long periods in which no rainfall is recorded. The average annual rainfall does not exceed 500 mm, and the mean annual temperature is about 14°C.

CROPS: Chickpeas and lentils

Chickpeas and lentils have attracted the interest of organic farmers due to the growing demand.

However, one of the main challenges involved in cultivating lentils is poor competitiveness against weeds.

In organic farming, good crop rotation and mechanical weeding are the most commonly used weed control methods. However, other methods such as crop mixing are starting to be used with good results.



Picture 1: Flowering lentils, Navarra 2022

Variety	Yield (kg ha ⁻¹)	TSW (g)	Protein (%)	Protein Yield (kg protein ha ⁻¹)
PAULA	935	28	27,3	255
GUAREÑA	117	30	28,9	34
EL ALCARABÁN	615	37	28,3	174
ITACA	755	36	25,9	196
ANICIA	555	24	26,3	146
ROSANA	315	25	27,5	87
FLORA	568	22	27,2	155

Table 1: Seed yield, thousand seed weight (TSW) and protein content from two years of screening lentils cultivars validated in Navarra, Spain (2020-2022)

BEST AGRICULTURAL PRACTICES:

- **Organic regenerative practices applied:**

- Mechanical weeding.
- Foliar spraying with organic products for pest control.

- **Best practices for sowing :**

- The recommended sowing dates in the northern zone are between the last two weeks of February and the first two weeks of March.
- Selection of varieties that are more tolerant to lodging or intercropping with cereal (e.g. wheat) in order to reduce plant lodging and weed competition.
- Selection of varieties better adapted to agro-climatic conditions.
- Sowing density 200 seeds per square metre.
- Sowing depth of 2-4 cm.
- An inter-row distance of 15-20 cm is recommended in order to reduce weed competition.

- **Best practices for managing the chosen crops:**

- Selection of well-drained soils.
- Adequate soil bed preparation is required to loosen the soil. A pass of the roller during sowing is recommended in order to facilitate germination and harvesting.
- Early mechanical weed control.

A trial was proposed to test various mechanical-weeding approaches: six strips were sown in order to evaluate the number and dates of different passes of the flexible spike harrow. A productive lentil variety with low sensitivity to lodging was chosen. The trial crops were sown with a cereal seeder at a row spacing of 0.15 metres and seed density of 200 seeds per square metre. The first pass was carried out when the lentil crop was well established and most weeds had grown two leaves.

Number of the strip	Number and date of the flexible spike harrow passes	Weeds reduction (%)	Crop lost (%)	Yield (kg/ha)
1 and 2	2 passes: 31/03/2021 and 19/04/2021	64 and 35% respectively	0 and 6% respectively	1198
3	2 passes: 6/04/2021 and 26/04/2021	55 and 54% respectively	0 and 0% respectively	1267
4	1 pass: 6/04/2021	55%	0%	822
5 and 6	1 pass: 13/04/2021	30%	8%	787

It was observed that the earlier the flexible spike harrow was passed, the greater the reduction of weeds. Furthermore, the yield was higher on the strips that had two passes of the flexible spike harrow than on the strips that had only one pass.

- **Best practices for harvesting the crops chosen:**

- Lentils should be harvested when the pods have completed maturation and the seeds have a water content of 12-14%.



Picture 2: Trial with 6 strips of lentil crop to test the number and dates of weeding.

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