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LIBRO DE RESÚMENES

Impact of increased CO_2 on growth, yield, and nutritional content of four local genotypes of legumes

Mohammad Abdullah[1*], Nieves Goicoechea[1], Johann Martínez-Lüscher[1], Cristina Mallor[2], Idoia Garmendia[3]

[1] Universidad de Navarra-Instituto de Biodiversidad y Medioambiente (BIOMA), Plant Stress Physiology Group (Associated Unit to CSIC, EEAD, Zaragoza), Irunlarrea 1, E-31008, Pamplona, Navarra, Spain.

[2] Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Av. De Montañana 930, 50059 Zaragoza, Aragón, Spain. Instituto Agroalimentario de Aragón-IA2 (CITA-Universidad de Zaragoza)

[3] Universidad de Alicante. Departamento de Ciencias de la Tierra y del Medio Ambiente

*Autor para correspondencia: mabdullah@alumni.unav.es

Resumen

Even though climate change may negatively impact agriculture production, surges in atmospheric CO_2 levels may increase crop yield. Since nitrogen is not as much of a growth-limiting factor for legumes, a more robust response is expected from them. However, there are still concerns about reducing the nutritional value of crops under elevated CO_2. This study aimed to evaluate the effects of CO_2 at ambient (415 ppm) and elevated (700 ppm) levels, in a greenhouse, on four local Fabaceae genotypes: Lens culinaris (lentil, LE), Vicia faba (faba bean, FB), Lathyrus sativus (chickling vetch, CV), and Cicer arietinum (chickpea, CP). Plants were separated into roots, leaves, stems, pods, and seeds at harvest. A spectrophotometer analyzed homogenized dried seeds for total soluble proteins, starch, and total soluble phenolics with a spectrophotometer. Monosaccharides and amino acid profiles were determined using HPLC-FLD. Mineral analysis was done using an inductively coupled plasma optical emission spectroscopy (ICP-OES).

The vegetative dry mass of all varieties showed a pattern of accretion under elevated CO_2, with CP being significant. There was a decline in seed yield in CP, while it increased in all other varieties, the increase was substantial in CV. While there were no significant changes in protein content, FB and CP did exhibit a downward trend. Elevated CO_2 increased the production of local legumes while their composition was barely affected. The total free amino acid content of the varieties increased except for LE which showed a slight decrease; CV was significant. Starch increased in all the types, except in CV, which showed a reduction. Total soluble monosaccharide content varied little, except for FB, which had a significantly elevated CO_2. Boron and Phosphorus content was reduced under elevated CO_2.

In conclusion, elevated CO_2 does affect productivity and composition. The variety of CV and FB responded strongly to the elevated CO_2. While further research is necessary to understand the mechanisms underlying legumes´ elevated CO_2 responses fully, it is clear that incorporating this knowledge into legume breeding programs will be crucial to future yield increases by optimizing the positive effects of CO_2 and mitigating its negative effects.

Keywords: climate change; elevated CO_2; local varieties; food security; nutritional composition.

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