Unlocking the Potential of Grass Pea: Improving Nutritional Traits Through Investigation of Natural Diversity

Staples J1, Edwards A1, Martin C1, Emmrich PMF1,2

*jasmine.staples@jic.ac.uk*

1 Department of Biochemistry and Metabolism, John Innes Centre, Norwich, UK

2 Norwich Institute for Sustainable Development, Norwich, UK

Grasspea is a hardy legume with a rich nutritional profile, including high levels of protein and diverse micronutrients. However, a diet heavily reliant on grasspea can result in neurolathyrism and irreversible paralysis of the lower limbs due to the presence of β-ODAP, a non-proteogenic amino acid. Recent advances in grasspea research, including the development of a reference genome and greater understanding of the genes responsible for β-ODAP synthesis1 will allow further investigation of traits in grasspea and its improvement as a resilient and versatile crop.

**Using GWAS to investigate traits in grasspea**

During this PhD project, 𝛃-ODAP content has been tested in 344 lines obtained from a diverse collection of resequenced grass pea germplasm. This identified a number of landraces low in 𝛃-ODAP and is being investigated further by k-mer based GWAS, to identify loci involved in 𝛃-ODAP content. This will be used to investigate 𝛃-ODAP synthesis further and generate markers for breeding low 𝛃-ODAP lines.

**Understanding the genetic basis of a low 𝛃-ODAP variety**

Prior to this project, a population of recombinant inbred lines (RILs) was created by crossing two parents with a large difference in 𝞫-ODAP concentration: the high 𝞫-ODAP European line LS007 and the low 𝞫-ODAP Indian line Mahateora. The seed 𝞫-ODAP content of this population has also been measured, and this is now being used to identify the genetic basis of the low 𝛃-L-ODAP trait in Mahateora.

***References:***

[1] Edwards A. et al, Genomics and biochemical analyses reveal a metabolon key to β-L-ODAP biosynthesis in Lathyrus sativus, Nature communications, 2023.