The same goal, a different approach: a new Belgian-Ethiopian project

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Ever since the discovery of the structure and the neuro-excitatory activity of β-ODAP (β-N-oxalyl-L-α,β-diaminopropionic acid) in grass pea seeds, research has focused on the reduction/removal of this secondary metabolite from the plant on the one hand, and the better understanding of its physiological activity in the brain on the other hand. Forty years later, the plant still produces the toxic metabolite albeit in a lesser amount, while the understanding of the brain's physiology and the action of β-ODAP on motoneurons has made great strides. But still no prevention has reached the people at risk, nor has a cure reached the victims of neurolathyrism. Only a few years ago an epidemic of neurolathyrism did occur in Ethiopia¹. Has something been overlooked? Or is there another road?

In many respectable publications, the nutritional quality of grass pea is praised as being rich in high quality protein, a statement that is being repeated again and again. When calculating the amino acid score of grass pea seed, the low score is stunning: only 20 % of the WHO/FAO proposed standard in which all essential amino acids are present in well-balanced optimal ratios. This is the lowest amino acid score of all commercial legumes. This means that even β-ODAP-free grass pea is not a healthy staple food and needs to be mixed with ingredients richer in those amino acids that are low in grass pea protein. This has been explained before and documented with historical accounts². The ancient Aztecs of Central America were smart enough to mix cereals and beans, which together form a much better complement of essential amino acids. Essential amino acids that are present at insufficient level in grass pea and are the limiting factor for the low amino acid score are the sulphur containing amino acids cysteine and methionine, needed for our protection against oxidative stress. Oxidative stress is involved in neuronal cell death that occurs in the upper motoneurons in neurolathyrism³.

Lathyrism has often been described as a disease of poverty, ignorance and drought-triggered famine. Improving the commercial value of grass pea can therefore solve one of the problems underlying the occurrence of lathyrism. Understanding the physiology of drought and salt tolerance and the role of β-ODAP can also be important for agronomic planning for a better quality product from the best suitable soil. Ignorance is a socio-political issue that is out of the reach of science. However, when we find a statistically significant link between the incidence of neurolathyrism and illiteracy, we may find out what information or habit is protecting literate people from developing this irreversibly crippling neurolathyrism⁴. What condiments are consumed together with grass pea that may protect the consumer from neurolathyrism, and what nutrients are present in those protective condiments?

An alternative road to improve grass pea and prevent neurolathyrism may then be to develop varieties of grass pea that are richer in those nutrients, together with the reduction of antinutritional factors such as β-ODAP. A project funded by the Flemish Inter-university Council (VLIR) will explore this alternative road. This project: "Improving the Nutritional Quality of Grass Pea (Lathyrus sativus)" is a collaborative effort between the Ethiopian Institute for Agricultural Research (EIAR) (formerly the Ethiopian Agricultural Research Organization, EA RO) and Ghent University in Belgium. It will be carried out by the Crops Research Department of EIAR and the Institute for Plant Biotechnology for Developing Countries (IPBO) in Gent. The project started on May 1st, 2004 and will run for four years.

Focal points of the project are:
- Training Ethiopian researchers in plant biotechnology.
- Dissemination of information to the populations at risk, concerning the prevention of neurolathyrism.
- Selection of both mutants and somaclones for low β-ODAP and improved amino acid composition.
- Study stability of the low-β-ODAP trait under abiotic stress.
- Examining the potential for applying genetic transformations to grass pea.
- Studies on the effect of essential amino acids as food/feed supplements on the nutritional quality of grass pea seed.

A mid-term evaluation will be done by an external expert. The project also calls for an open scientific conference to be organized near the end of the project in April 2008.

References


