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OCL Oilseeds & fats Crops and Lipids

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Introduction – Dossier Open Access

Varietal selection of oilseeds: the prospective nutritional and technological benefits
Perspectives offertes par la sélection variétale sur la qualité nutritionnelle et technologique des oléagineux

Introduction

I am very pleased to introduce this latest issue of OCL, which seeks to draw together the recent advances that have taken place in the overlapping fields of plant breeding, biotechnology and quality trait improvements. OCL has been supporting the lipid and oil crops community for over twenty years now. The Journal was launched in 1994 at a time when, after a first substantial reform of the CAP, diversifying crop and products had reached the forefront of the research and policy agenda. Plant breeders face a range of serious challenges: to remain competitive economically, to develop cleaner pest and diseases control strategies, and to meet the frequently conflicting societal demands regarding environmental protection, sustenance and health. Prioritizing these challenges is difficult as different criteria have to be taken into account for each. Notwithstanding, focusing on quality traits is always ranks high when the aim is to combine economic competitiveness with a high and increasing value of the final product. The most recent modification to the CAP and the emergence of agro-ecology policy bring forth market opportunities for new high value crops. These could be main crops or crops that have a brief development cycle and which could be inserted into diversified crop rotations during intercropping periods. An example of the latter would be *Brassica carinata* or *Camelina sativa,* both of which could be cropped in less than 110 days. The growth in understanding of seed-development metabolisms enables now the conception of strategies that target specific fatty acid profiles or specific cakes qualities. Recent results on *Camelina* from the Rothamsted group, published early this year, illustrate this very well (see Ruiz-Lopez *et al.* 2014). They show how to produce a plant with a high content of omega3 long chain fatty acids like DHA that are conducive to good health. Beaudoin et al review recent progress along these lines in this issue of OCL.

The methods and technology of plant biotechnology are progressing rapidly. I much admire Murphy's now famous graph of the accelerating reduction in the cost of sequencing technologies, illustrating how wide and fast the changes are. The same kind of rapid evolution can be observed in the field of quantitative genetics with GWAS approaches, high SNP maker densities of genetic maps, or in the field of microRNA and epigenetics. The link between genome structure and plant functions is still difficult to establish even if species bridging and "translational biology" are going some way to remove this obstcle. The main bottleneck is still phenotyping. Metabolomics platforms are available, but there is still a need for plant evaluation in the field and in controlled conditions. In France, the "investissements d'avenir" project PHENOME (INRA / CETIOM / Arvalis) is the starting point for a national network of infrastructures for high through output phenotyping. Applied and field research institutes like CETIOM are actually working hard to develop such infrastructure at the field level.

For known genes and functions it is possible to modify alleles through a range of mutation techniques, from chemical mutagenesis coupled with tilling, through to the meganuclease technologies employed initially in the medical sector. The recently introduced CRISPS cas9 techniques have brought about substantial cost reductions. They are also more powerful and enable, at quite a modest cost, the modification of targeted alleles in a given genotype. This kind targeted mutation could give rise to very useful new agronomic varieties. Remaining competitive using such techniques is certainly a challenge, not least because of the burden of regulatory constraints on the associated experimental fieldwork. Politicians and regulatory bodies are under pressure from environmental activists. Developing and promoting the large-sale use of targeted mutations will require some adaptation of existing regulations. Continuing exclusively with breeding methods-based evaluation will certainly impede competition in international markets, with potential heavy economic consequences for Europe's entire agricultural sector. The evaluation and registration of new plant materials should be based on their potential end products, using a rational, knowledge-based, assessment of likely risks and benefits. At present, we are a long way from a consensus on this. In 2014 for example, a CETIOM site was attacked by so-called environmental activists looking for "hidden GMOs". They targeted Clearfield rape genotypes, which are being developed across Europe with increasing success. They destroyed three of the principal field-trials platforms. Whilst

obviously unacceptable – the police were called – such illegal activism is a symptom of the current ignorance of the potential of new techniques to produce oils and fats with wide-ranging benefits for all members of society. Colleagues working in plant biotechnology and breeding will have to surmount immense communications challenges if they are to achieve the necessary levels of awareness among politicians, the regulatory bodies and, not least, the general public.

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