Recognizing the Past and Looking to the Future

R. Keith DOWNEY

on receiving the Eminent Scientists Award
at the 9th International Rapeseed Congress, Cambridge (U.K.) July 4-7, 1995

Thank you Rod Mailer, Mr. President and Colleagues. It is indeed a pleasure and an honour to receive such a prestigious award. I am honoured to share the platform with Dr. Morice and to join the select group of previous recipients with whom I have a long and fruitful association. To be recognized by your peers is without a doubt the highest honour one could hope to receive.

But the achievements upon which the award is based would not have been possible without the great support and collaboration of my colleagues. In the early years, there were the chemists Drs. Bert Craig, Claire Youngs and Les Wetter and fellow breeders Al Klassen and Sid Pawlowski and past GCIRC president Milt Bell. More recently, the team includes Ian McGregor and Gerhard Rakow and many others at Saskatoon. What has been accomplished has been a team effort. Therefore, on behalf of the Saskatoon team, I am pleased to accept this rare and beautilful medallion.

I have seen many changes and advances since my first involvement in rapeseed back in 1942. From the outset, the many problems and constraints we faced were viewed as opportunities and the crops expansion and acceptance attests to our success in capitalizing on those opportunities. But perhaps we should give the crop a medal for this is indeed an amazing crop. It has responded positively to almost every genetic and physiological pressure we have applied, whether it be for seed and oil yield, oil composition, lowered glucosinolates and fibre or greater disease resistance. But there are still many challenges to overcome. Among the more important are *Sclerotinia* resistance, more effective capturing of heterosis, and further improvements in meal quality, to mention only a few.

To help us achieve the next round of improvements, the crop has again demonstrated its versatility by being one of the very few commercial crops to quickly respond to all the biotechnologies (Table 1). However, the application of biotech and particularly the commercial reality of gene transfer has propelled rapeseed/canola into the forefront of a socio-scientific debate and forest of regulation.

Today we are already looking at a cascade of innovation (Table 2) for enhanced plant protection (weeds, insects, diseases), production (hybred pollen control systems, stress tolerance, high oil levels) as well as improved quality parameters (fatty acid modification, protein balance, reduced phytate and sinapin), not to mention molecular farming (pharmaceuticals as well as industrial products such as adhesives, plastics, etc.) However, to fully exploit the potential of this new germplasm base, that now has been expanded to include all living organisms, we must convince an indifferent but suspicious public that genetics and plant breeding are indeed extremely low risk sciences, which pose no threat to the food chain or the environment. However, in doing so we also assume the responsibility of making sure that this reputation is maintained. For if we are to provide the world's growing population with an abundant, highly nutritious food supply in 2050, plant breeders will need the freedom to use all the genetic tools at their disposal.

However, biotech is not a panacea, we are still limited to single dominant gene insertious, we do not know the plants biosynthetic pathways and interactions well enough to make the best use of this tool. However, it is clear that the opportunities today are just as great and exciting as in the past. I will be watching with great interest and I wish you well in your future endeavours. Thank you for the honour you have bestowed upon me and for the opportunity to have served you.

Table 1
New Techniques for Oilseed Breeding

- Gene mapping - RFLP, AFLP & RAPD's
- Embryo rescue
- *In vitro* haploid production
- Protoplast fusion
- Selection of somaclonal variants
- Transformation

Table 2
Gene Transfer in *Brassica* Oilseeds

- **Herbicide tolerance**
  Roundup, Basta, Chlorsulfuron, Bromoxynil
- **Pollen control systems**
- **Oil quality**
  High stearate, laurate,oleic and erucic oils
- **Meal quality**
  Elevated methionine, lysine
  Low indole-tryptophan decarboxylase
  Reduced phytate & sinapine
- **Insect resistance**
  Bacillus thuringiensis (Bt), Protease inhibition
- **Disease resistance**
  Elevated chitinase - *Rhizoctonia* tolerance
  Oxalate oxidase - *Sclerotinia* tolerance
- **Oil content**
  Pyruvate kinase, glycolytic isozymes
- **Molecular farming**
  Pharmacological neuropeptides,
  Enzymes, antibodies adhesives & plastics
- **Heavy metal sequestering**
  Human metallothionine gene