Panel IV Summary
Agronomic and Food Products in the Marketplace Lessons Learned - Moderators Comments

R.K. Downey[1] and Z.L. Chen[2]

The speakers of this session emphasized several common themes including the following:

1. Plant biotechnology has much to offer producers and consumers through the enhanced pest control, agronomic performance and increased product quality and nutritional worth.
2. The safety of products of biotechnology must be assured through a scientifically based regulatory framework founded on internationally accepted principles. However, it was stressed that such regulations as well as regulators must have a reasonable range in latitude so that rules and decisions could be amended as knowledge and practical experience with the technology in various plant species are acquired. The need for such flexibility and understanding is illustrated by the unique characteristics of the genetically modified carnations described by Dr. Chandler.
3. The need for wide acceptance of common data bases for target species was identified. The task of both the applicant and the regulator is greatly simplified if they are both working from the same general information base. It was also pointed out that there is a real need to allow data packages to be used in bridging the information gap between species and crops.
4. It was agreed that a good information flow to various targeted audiences is critical to the successful market introduction of any genetically modified plant (GMP). Speakers stressed the importance of informing government officials, producers and the public. However, they found that it has been particularly important to target professionals in nutrition and others in knowledge-based fields who enjoy a high level of public trust in order to build a strong coalition of support for the product.
5. It was also noted that one of the elements critical to the successful introduction of a GMP was information on the publics' thinking and to present the new product as a useful and needed innovation.

[1] Agriculture and Agri-Food Canada (AAFC), AAFC Research Center 107 Science PI, Saskatoon SK S7N 3R2, Canada.
[2] University of Peking, Beijing 100871, China.

6. It is clear that the world is a small place and trade is vital. Thus international exchange of information needs to start early. Importers, governments and consumers react negatively to surprise.

7. Speakers stressed that a friendly relationship with the media is of upmost importance. It is probably an understatement to say "People feel uncertain about a new technology." Honest communication has been the key to building to trust. However, as scientists, we do not enjoy the level of trust with the public as we once did and we are at a major disadvantage to our detractors in that we can not prove that something will never happen. You can not prove a negative! Even the wildest scenario has some level of probability. Thus we are frequently at a disadvantage in dealing with the media which is compounded by the fact that negative information is considered news while favorable reports and factual corrections rarely attract the same attention.

In this regard several of the speakers asked me to take the remaining time to address the Danish report on the transfer of the gene for glufosinate tolerance from *B. napus* to *B. rapa (=B.campestris).* (Mikkelsen, Andersen and Jorgensen, 1996. Nature. Vol. 380, p. 31.) Unfortunately I have only seen the letter to Nature which lacks details regarding some of the methods and materials used. However, based on previous papers published by some of the same authors the following appears to have occurred.

First, they grew under isolation glufosinate-tolerant *B. napus* and wild *B. rapa* (=*B. campestris)* as a 1:1 species mixture and separately harvested seed from each species. Second, they grew a large number of progeny from the *B. rapa* plants and identified those which were hybrids by their plant morphology. These interspecific hybrids were grown in plots surrounded by *B. rapa* plants and over 4,000 seeds from 32 interspecific hybrids were harvested. Upon spraying the backcross progeny with the herbicide glufosinate, 44 were found to be tolerant and morphologically *B. rapa*-like. Four of these plants had chromosome counts of 2n=20 or 21 (2n *B. rapa*=20) with over 90% pollen fertility. On crossing these plants with wild *B. rapa,* 416 backcross plants were obtained of which 42% were glufosinate-tolerant, indicating that the inserted gene had been transferred from *B. napus* to *B. rapa* under very strong selection pressure.

These findings have raised concerns in various quarters and need to be put in proper prospective. First, it has long been known that *B. napus* and *B. rapa* will cross naturally in the field and this possibility was carefully and fully assessed and deemed not to be an environment hazard when environmental releases were granted to herbicide-tolerant *B. napus* in both Canada and Europe. Second, it needs to be understood that *B. rapa* is not a weed of concern in Europe while in Canada it is grown as a commercial crop on some 4 to 6 million acres each year. Third, all studies to date with herbicide-tolerant *B. napus* have shown that the presence of such genes do not impart any environmental advantage to such plants unless the specific herbicide is applied. The same would apply to *B. rapa.* Fourth, subsequent information from Denmark indicates that a genetic analysis of wild populations of *B. rapa* has shown no evidence that a natural transfer of genetic material has taken place from *B. napus* to Danish wild *B. rapa.* Fifth, when Danish commercial *B. napus* rapeseed fields were examined, apparently no interspecific hybrids were found.

If the interspecific cross occurs so easily in nature why are interspecific hybrids not present in Danish fields and *B. napus* genetic markers not found in natural populations of *B. rapa?* Part of the answer lies with the fact that fall-sown winter rape competes very strongly with the spring-germinating wild *B. rapa.* But probably more important is the way in which seed for sowing commercial rapeseed fields is produced and regulated as indicated below:

a) European oilseed rape farmers purchase new certified seed each year.

b) Pedigree (Certified) seed fields are subjected to an official inspection and must be free of other *Brassica* species including *B. rapa.* Therefore there is little or no *B. rapa* seed in certified seed sold to producers.

c) Seed from commercial fields is processed for oil and only seed which has shattered from the pods remains in the field.

d) If interspecific hybrids are produced and volunteer in subsequent years they will either be controlled by presently available herbicides in the following crop(s) or if they appear in future oilseed rape fields they will backcross to the *B. napus* crop, not to *B. rapa.*

It should also be noted that the glufosinate-tolerant *B. napus* plants that were used in the Danish experiments were those developed by PGS in which the inserted gene resides in the *B. rapa* genome. Had they used either AgrEvo's or Monsanto's herbicide-tolerant *B. napus* in their experiment the outcome would have been quite different in that the inserted herbicide-tolerant genes in these transgenics reside in the *B. oleracea* genome. Thus to transfer the inserted gene to the wild *B. rapa* a crossover between non-homologous chromosomes would be required, which the companies have found difficult to recover despite many backcrosses.

If the transfer of herbicide tolerance (glufosinate or glyphosate) from *B. napus* to *B. rapa* is important environmentally then should we not be equally concerned with a mutant *B. napus* cultivar that is tolerant to the herbicide imidazolonone? Under European environmental regulations the herbicide-tolerant mutant could be grown or imported without restriction but not the transgenic cultivars. This is not a theoretical question. In Canada we are now commercially growing herbicide-tolerant *B. napus* cultivars arising from both mutation and genetic engineering. Is one a greater hazard than the other or are they all major advances in safe and productive pest management?