KEYNOTE THEME C

Canola, successful science

D. Dzisiak

Dow AgroSciences Canada Inc.
Calgary, AB, Canada

Canola is one of the great agricultural science success stories. Innovative traits and germplasm advancements have enabled a significant productivity gain making canola one of the largest and most valuable crops for producers and the food value-chain. Consumer trends continue to drive the need for more functional and cost effective food ingredients and productivity gains. The presentation will look across the value-chain at how food industry trends and the next generation of innovation will make canola an even more important crop to the global food industry.

KEYNOTE THEME C

Canola meal: Successes and opportunities to increase value

D. Hickling

Independent Consultant
Winnipeg, MB, Canada

Like canola oil, canola meal can be regarded as a success story. It is now the second most used protein meal in the world after soybean meal. It has found a premium market in its use as a feed ingredient for dairy cows. With increasing production of canola seed, the market for canola meal has continued to expand with no loss in value. Canola meal production in Canada increased from 2.5 million tonnes in 2008 to 4 million tonnes in 2014. The extra production has been exported, primarily to the US for dairy feed production. The relative value of canola meal to soybean meal in the US market during this period has stayed the same at 71%. It is a consistent and reliable protein source that is highly regarded around the world. Thanks are due to the founders and developers of canola for their dedicated work over the last 40 years.

Despite its success, there are still limitations and concerns about canola meal. It does not have the versatility of soybean meal. The protein content and overall nutrient digestibility is lower. It has found a steady market in the dairy, swine and aquaculture feed industries with increased growth potential in those markets but it does not have as wide an acceptance in poultry feeds. There are still some concerns with anti-nutrients, especially phytic acid, fibre and glucosinolate levels, which should all be reduced. There are opportunities to increase canola meal nutritional value by increasing protein content as well as improving amino acid and energy digestibility. Improvements can be made through plant breeding, processing and the use of feed enzyme technology with breeding changes seeming to be the most promising. Canola meal may never overtake soybean meal, but there are opportunities to increase its value so that it is an even more fearsome competitor.

KEYNOTE THEME C

Health actions of canola oil beyond cholesterol: The emerging belly fat connection

P. Jones

Richardson Centre for Functional Foods and Nutraceuticals,
University of Manitoba
Winnipeg, MB, Canada

Although current dietary guidelines advise restricting the consumption of saturated and trans fats, considerable debate continues regarding the optimal dietary blend of polyunsaturated (PUFA) versus monounsaturated (MUFA) fatty acids. Recent data have shown potential weight control advantages of diets higher in MUFA, thus the purpose of this presentation is to review and evaluate emerging science on overall health benefits of MUFA rich oils, particularly canola oil. Results of review articles and recent clinical trial data suggest that MUFA possess lipid lowering abilities. Specifically, diets with DHA-rich canola result in better overall lipid lowering and favorable Framingham Risk Scores due consequent to larger impacts on TG levels and blood pressure, when compared with other PUFA and MUFA-rich oil blends. Moreover, results of a series of human intervention trials suggest that diets high in MUFA, including canola oil, improve adipose distribution and reduce belly fat, possibly due to effects on a cluster of lipid metabolism mediators termed fatty acid ethanolamines. As such, MUFA-rich canola oil appears to be a desirable option for replacement of other dietary fats and oils to protect against overweight and reduce cardiovascular disease risk in susceptible individuals.

KEYNOTE THEME C

Development of new canola oils

W. Loh
L. DeBonte

Cargill Specialty Seeds & Oils,
Minneapolis, Minnesota, USA

willie_loh@cargill.com

Since its initial introduction into commercial production in 1993, high oleic canola oils have significantly impacted western Canadian agriculture. Over the past five years, up to 3,000,000 acres have been planted to high oleic canola varieties – roughly 15% of the total Canadian acreage. The high oleic canola acreage is incremental, and has not cannibalized any generic canola plantings. The best high oleic canola hybrid varieties rank with the best yielding generic canola hybrids and feature the best blackleg resistance available today. Essentially all these acres have been produced under closed loop with contracted growers benefiting from crop premiums above the market price for generic canola.

Since its introduction as a new to the world oil in 1994, high oleic canola oil today displaces ~1.4 billion pounds of partially hydrogenated oils annually. Reformulation by food processors and foodservice companies using high oleic canola oil effectively eliminates ~300,000,000 lb of trans fat and ~280,000,000 lb of saturated fat from public consumption every year. The nutritional improvement to public health, particularly in cardiovascular benefits, is huge. High oleic canola oil occupies the dominant position among all specialty oils in the food industry today. New entrants, e.g. high oleic soybean oil, are challenging this position and threaten to cannibalize the significant impact that high oleic canola oils have made to the entire Canadian canola industry.

As nutritional science, consumer needs and governmental regulations continue to evolve, new types of specialty canola oils will be needed to maintain the economic advantages created with the first generation high oleic canola oils. Such oils are expected to add additional incremental value to the industry. A view of market needs and potential canola based solutions will be reviewed, including agronomic requirements and food applications.

Rapeseed proteins: Extraction technologies, functional properties and applications

F. Pudel
R.P. Tressel
J. Palomino Oviedo
H. N. Idakiev
C. Spangenberg
K. Düring

Pilot Pflanzenöltechnologie Magdeburg e.V., Magdeburg, Germany

pudel@ppm-magdeburg.de

Background: Rapeseed proteins - which make up about 20 to 25 % of dry seed weight – possess high nutritional value as well as promising functional properties. In comparison to other oilseeds rapeseed contains two major fractions of storage proteins with completely different properties, the 2 S albumin napin with a molar weight of 12 - 17 kDa and the 12 S globulin cruciferin with a molar weight of about 300 kDa.

Objectives: A new technology to produce pure rapeseed proteins, consisting of gentle oilseed processing, aqueous protein extraction, precipitation of cruciferin and expanded bed adsorption ion exchange chromatography for isolation of pure napin (or a new protein mix) will be presented and compared with already described processes.

Methods: The new technology was developed in laboratory and up-scaled into small pilot scale. In order to evaluate the resulting products the following functional properties were determined: protein content and purity, solubility, denaturation behavior, foaming capacity and foam stability, emulsifying and film formation properties.

Results: The new process allows to produce napin with a purity > 98 %, cruciferin with a purity > 95 % and, if desired, a new protein mix of about 56 - 57 % napin and 43 - 44 % cruciferin. Napin is to 100 % soluble, has exceptional thermal stability and is easy to process in O/W-emulsions which possess a very good stability. Cruciferin is characterized particularly by very good foaming properties.

Conclusions: Protein separation is reproducible and can be scaled-up. The resulting protein products possess interesting functional properties enabling a wide range of possible uses both in food and non food applications (cosmetics, biochemistry, pharmaceutical). Particularly, napin is comparable or even better than egg albumin and could therefore replace animal albumins, e.g. in vegan foods.

KEYNOTE THEME C

Nutritive value of canola meal: The dietary fibre story

B. Slominski

Department of Animal Science
University of Manitoba
Winnipeg, MB, Canada

As a consequence of the small size and high oil content of canola seed (42-45%), the resulting meal contains a relatively high proportion of dietary fibre with the neutral detergent fibre (NDF) and total dietary fibre (TDF) values being higher than those of soybean meal (SBM).

In addition to the fibre components of the seed, including non-starch polysaccharides (NSP), glycoprotein, and lignin with associated polyphenols, the dietary fibre content of canola meal (CM) could be increased further in the pre-press solvent extraction process since some screenings and other dockage are sometimes added back into the meal. As well, the processing conditions and temperatures used in the desolventizer-toaster may increase the dietary fibre content of the meal due to protein damage and the formation of lignin-like Maillard reaction products. Based on the recent surveys conducted in Canada, the content of NDF and TDF of CM averaged 29.6 and 38.0% DM, respectively, and ranged from 27.1 to 33.4% for NDF, and from 34.8 to 41.9% for TDF.

Various approaches have been undertaken in an attempt to reduce the fibre content of CM. These include breeding for yellow-seeded canola, dehulling or the use of microbial enzymes to enhance nutrient utilization by monogastric animals. Superior quality characteristics of newly developed yellow-seeded *B. napus* canola and canola-quality *B. juncea* mustard have been demonstrated. Although significantly lower in the dietary fibre contents, similar growth performance parameters in broiler chickens and turkeys to those of the conventional canola meal and SBM were observed when the diets were formulated based on digestible amino acids and available energy contents. This would indicate that all types of CM could effectively replace SBM in poultry rations, and that the development of low-fiber canola would result in quantitative changes as evidenced by increased oil, protein, and sucrose contents rather than qualitative changes due to decreased fiber content.

Another route in reducing fibre content is hull removal. When evaluating the meal from the tail-end dehulling process using sieving technology, a significant increase in protein content of the dehulled versus standard meal (from 36.8 to 42.0%) and a substantial reduction in the content of dietary fiber (from 30.0 to 21.4%) were noted. However, when fed to young broiler chickens and weaned pigs, no difference in growth performance was observed. Therefore, it could be concluded that canola fibre is simply a diluent and has minimal effect on nutrient utilization. This could be due to the fact that most of canola fibre is associated with the hull fraction and thus less water-soluble and biologically active. In addition, fibre components, including NSP and glycoproteins, may serve as substrates for feed enzymes and contribute to the release of additional energy (i.e., ~100 kcal/kg) from CM.

The exception to this would be meal overheating during pre-press solvent extraction process which may result in reduced digestibility of some amino acids. Based on our recent study with broiler chickens, the standardised ileal digestible amino acid contents ranged from 2.18 to 2.50% for arginine, 1.74 to 2.00% for lysine, 0.49 to 0.65% for methionine, and 1.00 to 1.38 for threonine. Such ranges of values are clear indication that the fraction of fibre deriving from amino acid damage would be an indication of low meal quality.