#139

Forecasting the future of oilseed rape co-products: Traditional breeding and modified genetics trade-offs

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Background:

Competitiveness of oilseed rape products is improved by such co-products as high oleic and low linolenic (HOLL) or docosahexaenoic acid (DHA) which properties and prices buyers compare with other vegetable oils they buy at global markets. While genetically modified organisms (GMOs) and new breeding techniques (NBTs) raise concerns about their safety and environmental impact according to regulations the communication is needed to address these challenges and ensure the sustainability of the industry.

Objectives:

The objective is to find solution for recent bans of GMO and NGT improving sustainability of both the oilseed rape product and the industry according in specific market segments.

Methods:

The study compared scenarios of consumer preferences to incentivize growers and scientists to develop competitive co-products. Methods compare three scenarios according to attributes of different market segments. Those attributes of oilseed rape were genetic composition, isolation of territories, climate change impacts, availability of land and water resources, and government policies and regulations on GMOs and NGTs.

Results:

The first scenario involves the continued cultivation of traditional oilseed rape varieties, with a focus on improving yields and quality to meet market demand for vegetable oils. This is relatively low-risk scenario which may provide stable returns for growers and processors under increasing competition from other vegetable oils, such as soybean and palm oil.

The second scenario changes PUFA content by genetic modifications of oilseed rape varieties, such as HOLL or DHA, to offer competitive advantages in terms of nutrition and functionality. However, this scenario also poses greater risks due to regulatory constraints on environmental impacts.

A third scenario proliferates supply chain by the development of alternative co-products, such as biofuels or industrial chemicals, which can be produced from oilseed rape. This scenario may provide opportunities for growers and processors to sell their products to new market segments but require significant investments in research and development.

Conclusions:

Competitive advantages of oilseed rape over other vegetable oil crops and starch/sugar-producing crops have demonstrated trade-offs at different target segments. The first scenario of traditional improvement of yields and oil quality targets global consumers in recent structure. The second scenario of principal changes of composition of oils either with or without GMO or NBT is targeting prosumers who can solve administrative barriers. Small and large farms may benefit from the development of high-yield, and disease-resistant varieties of oilseed rape that can be grown with less pesticide use. The third scenario targets advanced industrial technologies which satisfy global consumers by non-GMO and NBT-free oilseed rape oils due to advanced industrial processing.

The three proposed scenarios simplify setting of breeding objectives, farming structures, and return on investment for industry according to activity of prosumers and legal constraints. Researchers are challenged to more precisely specify properties of proposed market segments providing opportunities for the commercialization of these co-products, and technologies on the base of oilseed rape genetics and industry over features of other crops.