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A major breakthrough in the breeding of Brassica.napus with high linolenic acid content, which linolenic acid content of germplasm resources exceeding 21%, and of hybrids about 15%

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Short Communication

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ABSTRACT

Linolenic acid is the basic substance that makes up cell membranes and bioenzymes, and is also a precursor to the omega-3 series of polyunsaturated fatty acids, which can produce eicosapentaenoic acid (EPA)and docosahexaenoic acid (DHA) (EPA and DHA are the main components of fish oil)in the human body,only sufficient α-linolenic acid in food, Omega-3 fatty acids can function effectively. Linolenic acid is a nutrition board of human beings today, so the World Health Organization (WHO), the Ministry of Health of the People's Republic of China and the Chinese Academy of Nutrition unanimously considered that linolenic acid must be supplemented.

INTRODUCTION

Linolenic acid is needed by the human body, but it can not be synthesized, must be taken from food. The insufficient intake of linolenic acid is one of the main reasons for the rising incidence of cancer and the trend of low age in human sub-health and chronic diseases (cardiovascular and cerebrovascular diseases, etc.). At present, linolenic acid comes from plant and animal. Animal linolenic acid mainly comes from marine fish and algae. In recent years, with the improvement of the human health concept, the public consumption demand for linolenic acid has greatly increased. As Marine biological resources declining and environmental pollution improving, deep -sea fish oil is also scarce, so the search for plant sources of linolenic acid is urgent increasingly.

More than 50% of the fatty acid intake in human body comes from edible vegetable oil, so it is a feasible way to supplement linolenic acid by improving the fatty acid composition of edible vegetable oil. The fatty acids of rapeseed oil are mainly long-chain fatty acids (the number of carbon atoms 16-18) and ultra-long chain fatty acids (the number of carbon atoms greater than 20), and the fatty acid composition of rapeseed oil is more balanced, and resistance to high temperature, suitable for a variety of cooking methods, was recognized as safe cooking oil. With the development of science and technology and the improvement of people's health awareness, rapeseed oil has shown more and more nutritional value and health care function. Currently, rapeseed oil contains about 9% linolenic acid, which is one of the three common vegetable oils (rapeseed oil, soybean oil and flax oil) rich in linolenic acid.

Both the United States (2006) and France (2010) recommend daily intake of rapeseed oil to increase linolenic acid intake. Rapeseed oil with rich linolenic acid has greater oxidation stability than fish oil and does not have the the fishy smell of fish oil.

In addition，rapeseed oil comes from crops, its linolenic acid content can be improved through genetic breeding, and its raw material cost is low, which can greatly reduce the environmental pollution caused by fish and algae producing fish oil and the high production cost.

In recent years, some rapeseed breeders in China have improved the content of linolenic acid in rapeseed germplasm to 15% or so. In 2018, those breeders, in Hybrid Rapeseed Research Center of Shaanxi Province in China, obtained a new strain with exceeding 21% linolenic acid from their own resources. Its fatty acid composition is:6.7% saturated fatty acid, 42.89% oleic acid, 26.72% linoleic acid, 0 erucic acid, and 20.78umol glucosinolate/g cake, and the oil content is more than 45%, the strain was preliminary thought to be mutated non-transgenic strain. It has been proved that its heredity is stable, and there is no bad shape, disease, late ripening and so on. At the same time, the hybrids, which was combined by the germplasm material of 15% linolenic acid, whose yield reached to 4723.5 kg /hm^2, and 4.5% higher than the control, and 46.58% oil content, is expected to be put into production in recent years.

Breeding high-linolenic acid strains in *Brassica napus* provides a cheap germplasm and convenient way for the production of fish oil on land, and also creates a material basis for the production of functional rapeseed varieties with food homologous medicine.