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# The development of Zhongyouza501, a hybrid variety with super-high yield under dense planting, will lead a Green Revolution in rapeseed

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**Background:**

In the past decade, the seed yield of rapeseed in China is about 2 t/ha, which is much lower than Europe, Canada and even the world. The monocot crops represented by rice, wheat, and maize has achieved the first Green Revolution through dwarfing and density tolerance breeding. After extensive investigation, professor Hanzhong Wang believed that the rapeseed yield could also been significantly improved by largely increasing its planting density.

**Objective:**

To develop rapeseed cultivars with a breakthrough in oil yield, the chemical induced male sterility was used to produce two-line hybrid combinations with high yield and oil content, density tolerance, disease, and lodging resistance, suitable for mechanized harvesting, glucosinolate and erucic acid content meeting double low standards.

**Methods:**

A large number of elite DH lines with excellent comprehensive traits were obtained by pyramid hybridization of the backbone parents of rapeseed, followed by molecular marker assisted selection, microspore culture and chromosome doubling. Among them, 5DH2900 exhibited higher yield, more seeds per silique, more branches per plant, vigorous growth during the seedling stage, moderate maturity time, and seed oil content of over 50%; ZY8033 exhibited more branches per plant, good resistance to disease and lodging, and seed oil content of over 55%. Variety comparison and regional trials were performed on the hybrid combination between 5DH2900 chemically induced male sterile line 2900CA and male parent ZY8033.

**Results:**

In the test of new varieties in the lower reaches of the Yangtze River in 2019-2021, the full growth period of 9zyP33 (2900CA×ZY8033) was 222.3 days. The plant height was 161.9 cm, with 8.7 effective branches per plant, 391.8 siliques per plant, 24.1 seeds per silique, and thousand-seed weight of 4.21 g. The incidence rate of sclerotinia sclerotiorum in the field was 27.15%, the disease index was 21.31, and the disease nursery was low. The oil content of the seeds was 50.38%, the erucic acid content was 0.02%, and the glucosinolate content of the meals was 23.18 μmol/g. It also showed strong resistance to lodging. Its seed and oil yield was 3.20 and 1.61 t/ha, with an increase of 12.66% and 26.93% respectively, compared to the control Fengyou737. On April 24, 2022, at Xiangzhou District, Xiangyang City, Hubei Province, an authoritative expert group identified that the dense-tolerance and high-yield new variety Zhongyouza501 (9zyP33), supported by the dense planting of 450,000 plants/ha (double the current planting density of rapeseed in China) and high-yield cultivation technology, had a theoretical seed and oil yield of 6.30 and 3.17 t/ha respectively, which both created a new record for high yield of winter-type rapeseed in China.

**Conclusions:**

Taken together, the successful application of density-tolerant and high-yield new variety Zhongyouza501, dense planting and high-yield cultivation technology is expected to lead a new Green Revolution in rapeseed and achieve the goal of doubling oil production per unit area.