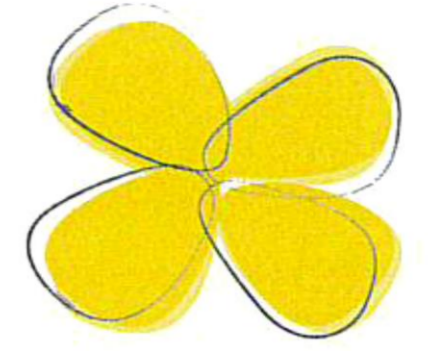




Breeding of a multi-functional *Brassica napus* variety

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Introduction

Cruciferous crops play important roles in human life. About forty percent edible oil in the world is manufactured from oilseed rape (*B. napus*, *B. juncea*, *B. campestris* and *B. carinata*) and we can find many kinds of cruciferous vegetables in supermarkets (Dai et al, 2014; Shi et al, 2009). In addition, cruciferous crops are produced nectar resources, forages, green manures and decorative plants. As one of the most important cruciferous crops, *B. napus* has almost all the functions as those of other cruciferous crops. The objectives of this study are to breed a *Brassica napus* variety to meet several market needs.

Materials and methods

The breeding procedures are as following: we resynthesized one *B. napus* line by interspecific hybridization between one *B. oleracea* line Zixin with purple leaves and a Chinese cabbage line (*B. pekinensis*) Huang 75-28 (Fig. 1). In order to improve seed qualities of the resynthesized *B. napus* line, it was crossed with *B. napus* line DL077 with low erucic acid content and low glucosinolates content and finally obtained *B. napus* variety Pale Petal No. 1 with double-low quality.



Fig. 1 One *B. napus* line was resynthesized by interspecific hybridization between one *B. oleracea* line Zixin (A) with purple leaves and a Chinese cabbage line (*B. pekinensis*) Huang 75-28 (B).

Results and discussion

The outstanding characters of Pale Petal No. 1 are its multi-functional usages such as oilseeds, decoration plants and vegetable.

Firstly, Pale Petal No. 1 is one *B. napus* variety with high yield, fine quality, resistances or tolerances to several stress environments. Therefore it can be used in rapeseed production in Henan Province and Huanghuai basin in China (Table 1, 2 and 3).

Table 1 Agronomic traits of Pale Petal No.1 in 2016-2018 at Yuanyang site

Variety	Branching position (cm)	Plant height (cm)	No. of primary branches	Length of inflorescences (cm)	No. of siliques per plant	Seed no. per silique	1000-seed weight (g)
Pale Petal No.1	31.5	176.6	8.1	26.7	235.1	25.7	3.9
Shuangyou No. 9 (CK)	40.5	187.7	8.2	25.3	221.5	21.8	3.8

Table 2 Stress resistances of Pale Petal No.1 in 2016-2018 at Yuanyang site

Variety	Erucic acid content (%)	Glucosinolates content (μmol/g)	Cold injury index	Cold injury rate (%)	Sclerotinia index	Sclerotinia rate (%)	Lodging rate (%)	Lodging degree
Pale Petal No.1	0.85	19.4	51.6	100	31.8	55.2	33.3	Tilt
Shuangyou No. 9(CK)	0.73	29.3	27.4	100	33.1	67.1	66.7	Lodging

Table 3 Yield results of Pale Petal No.1 in 2016-2018

Variety	Yield (kg/ hm ²)		Average yield (kg/ hm ²)	Increase rate over CK (%)
	Tanghe	Yuanyang		
Pale Petal No.1	2548.65	2683.35	2616.00	4.16
Shuangyou No. 9 (CK)	2660.40	2362.80	2511.60	0.00

Secondly, Pale Petal No.1 has novel pale petals, which are different from traditional yellow petals and white petals, and can be utilized in sightseeing. Results of genetic analysis showed that yellow petal was dominant to pale petals (Fig. 2 and 3).

Thirdly, it has purple leaf veins, stalks and bolts instead of traditional green color and these characters also can be used in sightseeing (Fig. 1, 2 and 3).

Fourthly, its bolts have oxidation resistance because there is one kind of cyanidin Yazuo pigment (1.52 mg/kg) in its bolts (Table 4). Cyanidin is one kind of antioxidants and cyanidin does not exist in traditional varieties with green leaves, stalks and bolts. Other nutritional qualities in this cultivar are about equal to traditional cultivars. In the bolts of this cultivar, the protein content is 3.29 g/100 g, which is slightly less than check Shuangyou No.9 (4.04 g/100 g) and is more than that in purple bolts variety

Huangjiahong (3.15 g/100 g). This cultivar has the same crude fiber content in bolts as check Shuangyou No.9 (about 1%). This variety has less α - Vitamin E (0.0918 mg/100g) than those in both Shuangyou No. 9 and Huangjiahong (Table 4).

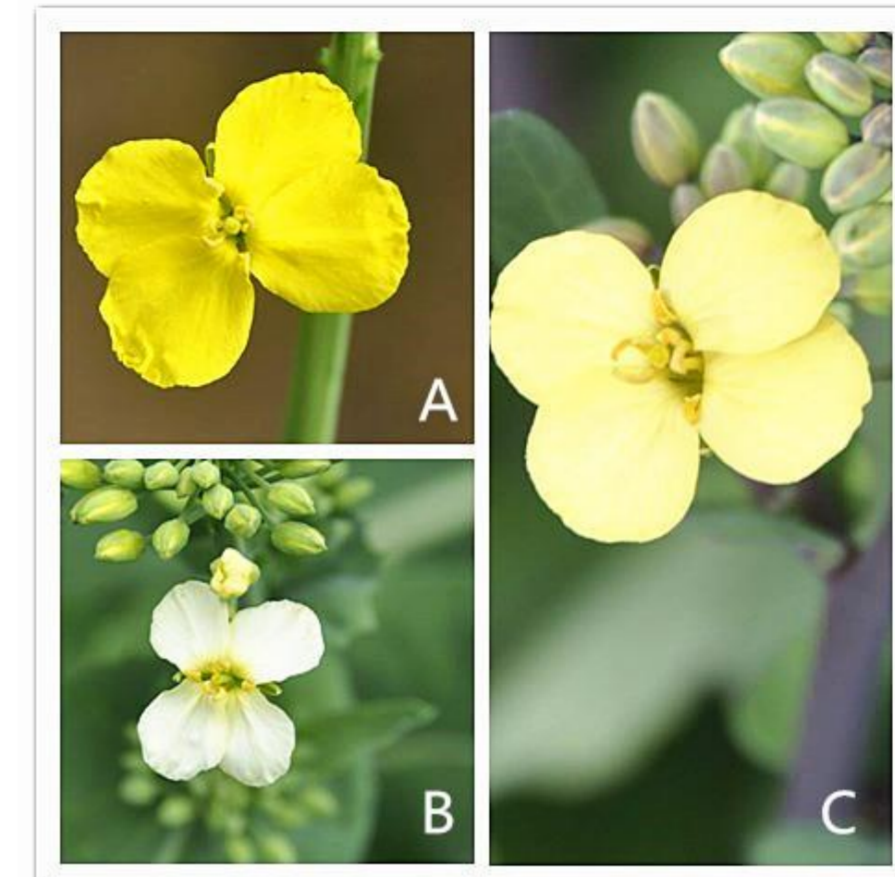


Fig. 2 Pale Petal No. 1 (C) with purple leaf veins, stalks and bolts. The check varieties are Shuangyou No.9 (A) with yellow petals and a line with white petals (B).

Table 4 Analysis results of nutritional ingredients in bolts of Pale Petal No.1 and purple bolts Huangjiahong

Ingredients	Unit	Shuangyou No. 9 (CK)	Pale Petal No.1	Purple bolts (Huangjiahong)
Protein content	g/100g	4.04	3.29	3.15
Crude fiber content	%	1.06	1.04	1.00
α -Vitamin E	mg/100g	0.162	0.0918	0.194
(β + γ) -Vitamin E	mg/100g	0.00	0.00	0.00
δ - Vitamin E	mg/100g	0.00	0.00	0.00
Delphinine	mg/kg	0.00	0.00	0.00
Yazuo pigment	mg/kg	0.00	1.52	45.6
Petunias pigment	mg/kg	0.00	0.00	0.00
Pelargonidin	mg/kg	0.00	0.00	0.00
Peonidin	mg/kg	0.00	0.00	0.93
Malvidin	mg/kg	0.00	0.00	0.00



Fig. 3 Different kinds of petal colors in *B. napus*. A is the Chinese violet cress (*Orychophragmus violaceus* L.) with purple petals. B, C, D and E are *B. napus* lines with petals of deep yellow, white, pale and traditional yellow, respectively.

Conclusions

As one of the most important oilseed crops in the world, *B. napus* also can be improved to be multiple-functional crops such as oilseed crop, vegetable, decorating plants.

References

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