# Inheritance of seed coat colour of the hybrids Brassica campestris ssp.pekinensis x B.campestris ssp.trilocularis Yellow Sarson

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## Introduction

Aiming at obtaining improved rape genotypes /Brassica napus L./ there's a necessity to get vigorous plants with yellow seed coat. As it's well known, this character causes higher protein and fat content and lower crude fibre content /Jönsson R., Bengtsson L.,1970; Pawlowski S.H., Youngs C.G.,1969; Stringam G.R., McGregor D.I., Pawlowski S.H.,1974/. It has been stated, that the seed coat colour depends at least from three independent factors: $Br_1Br_1$,$Br_2Br_2$,$Br_3Br_3$, which in recessive state are causing the pale yellow colour of the seeds /Mohammad A., Sikka S.M., Aziz M.A.,1942; Jönsson R.,1977/.

The aim of this experiment was to establish the degree of homozygosis of seed coat colour in the $F_5$ progeny of the hybrids between chinese cabbage /Brassica campestris ssp.pekinensis "Chinese cabbage"/ and yellow seeded B.campestris ssp.trilocularis Yellow Sarson.

The progeny of both these forms, representing vigorous, yellow seeded recombinants with lower glucosinolates content, could provide valuable components in crossings of diploid species aiming at obtaining yellow seeded artificial Brassica napus.

## Material and methods

$F_4$ progeny of the hybrids Brassica campestris ssp.pekinensis "Chinese cabbage" x B.campestris ssp. trilocularis Yellow Sarson was used in this experiment. All the former progenies of these hybrids were cultivated in plastic tents, in favourable selfpollination conditions.

Sib progeny of the plant 405N, differing in seed coat colour was sown in the greenhouse for these investigations. Among the seeds of the plant 405N/12 and 405N/28 two groups were distinguished: with pale yellow and dark yellow seed coat and were sown apart. After harvesting, observations, dealing with the seed coat colour in the progeny of each single plant, have been done.

Experimental results

On the basis of the measurements of morphological characters made at the beginning of flowering period and during full maturity it has been stated, that among plants originating from yellow seeds there is only a slight tendency of height diminishing at the time of full maturity. But at the beginning of flowering period, plants with yellow seed coat, although this is a recessive character, seem not to be less vigorous, than the plants deriving from seeds with dark colours /Barcikowska B.,1982/. This fact is promising for the future work, because of possibility to select vigorous yellow seeded forms of B.campestris, which may be used as valuable parental forms for artificial B.napus breeding.

Table 1 illustrates the seed coat colour of the $F_5$ progeny of investigated plants.

As it may be seen, from the presented results, the entirely homozygosis of the pale yellow seed coat colour has appeared only in the progeny of the plant 405N/28. The next in the degree of homozygosis is the progeny originating from the dark brown seeds of the plant 405N/4 and 405N/1 and of the pale yellow seeds of the plant 405N/12. There's remarkable coincidence in the segregation ratios of the seed coat colour in the progeny of the dark yellow seeds of the plants 405N/12 and 405N/28. In both these progenies only the half of them has the seed coat colour of their maternal form. This represents an evidence of heterozygosis, dealing with dark brown seed coat colour. To clarify this fact, there's possible to propose the following assumptions. When we agree to the statement, that the yellow-brown seed coat colour depends from the dominant gene $Br_3$ in a homozygous state $Br_3Br_3$ and the pale yellow colour is the result of these genes action appearing in a homozygous recessive state $br_3br_3$ /Mohammad A., Sikka S.M., Aziz M.A.,1942/, we can make a hypothesis, that the dark yellow seed coat depends from the presence of the gene $Br_3$ in the heterozygous state $Br_3br_3$. Then the plant with dark yellow seed coat, after selfpollination, forms the gametes $Br_3$ and $br_3$, which

Table 1 Seed coat colour of the $F_5$ progeny of the hybrids Brassica campestris ssp.pekinensis "Chinese cabbage" x B.campestris ssp.trilocularis Yellow Sarson

| No of plant | Colour of the seeds sown /$F_4$ progeny/ | Number of plants investigated | Number of plants of the $F_4$ progeny with seed coat colour in their pods /$F_5$ progeny/ | | | | |
|---|---|---|---|---|---|---|---|
| | | | pale yellow | dark yellow | light brown | dark brown | dark blue |
| 405N/1 | dark brown | 64 | 9 | 0 | 2 | 53 | 0 |
| 405N/4 | dark brown | 27 | 2 | 0 | 5 | 20 | 0 |
| 405N/12 I-st group | pale yellow | 23 | 17 | 2 | 3 | 1 | 0 |
| 405N/12 II-nd group | dark yellow | 26 | 8 | 13 | 2 | 3 | 0 |
| 405N/22 | dark blue | 55 | 4 | 2 | 2 | 37 | 10 |
| 405N/28 I-st group | pale yellow | 53 | 53 | 0 | 0 | 0 | 0 |
| 405N/28 II-nd group | dark yellow | 21 x/ | 6 | 9 | 6 | 0 | 0 |

x/ $Chi^2 = 0,75$ ; $0,8 < p < 0,5$

after pairing give rise to the progeny with 25% light brown seeds $Br_3Br_3$, 50% dark yellow seeds $Br_3br_3$ and 25% pale yellow seeds $br_3br_3$. As it can be seen in the table 1, the segregation ratios of the $F_5$ progeny of the plant 405N/28 /II-nd group/ agree in general with expected segregation ratios presented above: among 21 plants investigated there were 6 plants with light brown seeds, 9 plants with dark yellow seed coat and 6 with pale yellow seed coat colour. The $Chi^2$ test in this case is positive and amounts 0,75 for probability $0,8 < p < 0,5$.

The small number of dark blue seeds in the progeny of the plant 405N/22 with the same colour of the seeds is remarkable. This would be the evidence of entirely dominance of the genes responsible for the dark blue colour.

## Conclusions

1. The progeny of the plant 405N/28 /I-st group/ represents entirely homozygosis dealing with pale yellow seed coat colour and may be used in the future crossings aiming at obtaining artificial yellow seeded Brassica napus.
2. The segregation ratios of the seed coat colour of the II-nd groups in the progenies of plants 405N/12 and 405N/28 suggest, that this colour depends on the gene $Br_3$, acting in the heterozygous state $Br_3br_3$.
3. The most numerous seed coat colours in the $F_5$ progeny of the plant 405N/22 with dark blue seeds, suggest, that this character depends on the polygenic system. But the accurate determination of their symbols requires further investigations. On the basis of the observations up to date it may be only concluded, that with the increasing number of dominant genes the intensity of the seed coat colour increases, representing display of colours from pale yellow, through different undertones of yellow, brown, to the dark blue.
4. Differing segregation ratios of the light brown seeded progeny of the plants 405N/1 and 405N/4 with dark brown seeds, do not allow to establish the way of inheritance of this character and suggest the necessity of further investigations, dealing with factors causing the light brown seed coat colour.

References


1. Barcikowska B.: Morphological Characters of $F_4$ Progeny of the Hybrid Brassica campestris ssp.pekinensis Chinese cabbage x B.campestris ssp.trilocularis Yellow Sarson with different seed coat colour. Cruciferae Newsletter No.7, 1982, p.11.

2. Jönsson R., Bengtsson L., Sveriges Utsädesföreп. Tidskr. v.80 1970, p.149-155.

3. Jönsson R.; Yellow-seeded Rape and Turnip Rape. II. Breeding for Improved Quality of Oil and Meal in Yellow-seeded Materials. Sveriges Utsädesföreп. Tidskr. v.85 1975 c, p.271-278.

4. Jönsson R.: Breeding for Improved Oil and Meal Quality in Rape /Brassica napus L./ and Turnip Rape /Brassica campestris L./. Hereditas v.87 1977, p.205-218.

5. Mohammad A., Sikka S.M., Aziz M.A.: Inheritance of Seed Colour in Some Oleiferous Brassicae. Ind.J. Genet. Pl. Breed. v.2 1942, p.112-127.

6. Pawlowski S.H., Youngs C.G., Proc. 2 nd Ann. Meeting, Rapeseed Assoc., Canada 1969, p.47-51.

7. Stringam G.R., McGregor D.I., Pawlowski S.H.: Chemical and Morphological Characteristics Associated with Seedcoat Colour in Rapeseed. Proc. 4-th Int. Rapeseed Conf., June 1974, Giessen, Germany, 1974, p.99-108.