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Review article

MODE OF INHERITANCE OF YIELD AND YIELD COMPONENTS IN CABBAGE (*Brassica oleracea* var. *capitata* L.)

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Used in this study were seven divergent cabbage cultivars, which we crossed using the complete diallel cross method. The traits we analyzed are important for further selection and were actually chosen based on this. The study's results showed the traits to be significantly divergent, which represents a significant source of variability for the next cycle of selection. The predominant mode of inheritance of head masss and the edible portion of the head was superdominance. Variation of these two traits was prominent in both the parents and the hybrids, the primary reason being the differences in earliness of maturity. Yield once again proved to be a complex trait, varying in the parents and the hybrids alike. The variability of yield was much larger in the hybrids than in the cultivars. Superdominance occurred 23 times.

Key words: cabbage, inheritance, yield, yield components

INTRODUCTION

Yield is a complex trait. In cabbage, it is determined by head mass and head number per unit area. What is of interest to the consumer is the edible portion

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of the head, i.e. what remains after the core and the outer leaves are removed. During the whole cycle of selection and breeding, we always try to make sure that both the initial materials and the new hybrid or cultivar have as large a head mass and as high a contribution of the edible portion of the head as possible. We stress this because cabbage is a highly significant vegetable crop in economic terms due to both the large acreage it is grown on and the high economic returns its production brings.

The objective of this paper was to investigate the mode of inheritance of head mass, the edible portion of the head, and yield.

MATERIALS AND METHODS

Seven divergent cabbage genotypes with differing yields and yield components were chosen based on previous studies. These cultivars all have different origin, which represents a potential source of desirable gene combinations to be used in future breeding work. Used in the the study were the following cultivars: Futoški (a late domestic cultivar adapted to the conditions of the Vojvodina province, suitable for fresh use and pickling alike), SM-10 (a late cultivar, grown quite a lot in central Serbia, has a large head suitable for both fresh use and pickling), Ditmar (an early cultivar of German origin, one of the most widely grown cultivars for early production in Yugoslavia), Kopenhaški (a Danish cultivar for early and medium early production, suitable for fresh use), Prva Žetva (an early Dutch cultivar intended for fresh use), Pourovo Červene (a late Czech cultivar of red cabbage), Kjose (a medium late Bulgarian cultivar intended for fresh use).

The experimental part of the study was carried out in the greenhouse and in the field at the Experiment Field of the Vegetables Department of the Institute of Field and Vegetable Crops in Novi Sad. In the greenhouse, the cultivars were crossed using the complete diallel cross method. After the fruit bearing and seed setting, a field trial was established. A randomized block design with five replications was used. Each combination was represented by 30 samples and head mass, the edible portion of the head and yield were studied.

Differences between the parents' and hybrids' means were tested by the t-test in order to determine the mode of inheritance of the traits concerned.

The inheritance of quantitative traits in the diallel crosses was determined using regression analyses according to MATHER and JINKS (1971).

RESULTS

Head mass mean values and components of variability - The highest head mass mean value among the parents was recorded in the variety Futoški and the lowest in the early variety Prva Žetva. This is understandable considering that Futoški is a late variety whose growing season is twice as long as that of Prva Žetva (Table 1).

Table 1 – Mean value (kg), and variability of head mass in cabbage

Variety and F1 hybrids	$\bar{x} \pm S_{\bar{x}}$	S	CV	t-test ♀	t-test ♂
KJOSE	1.39 ± 0.43	0.23	16.9		
K. x *FUTOŠKI*	4.18 ± 0.25	0.13	3.3	+ +	+ +
K. x P.ČERVENE	2.01 ± 0.20	0.11	5.64	+ +	+ +
K. x *DITMAR*	2.41 ± 0.24	0.13	5.54	+ +	+ +
K. x *KOPENHAŠKI*	2.57 ± 0.34	0.19	7.42	+ +	+ +
K. x *P.ŽETVA*	1.64 ± 0.46	0.25	15.6	+ +	-
K. x *SM-10*	2.42 ± 0.39	0.21	8.93	-	+ +
FUTOŠKI	2.51 ± 0.25	0.14	6.19		
F. x *KJOSE*	3.04 ± 0.27	0.15	4.98	+ +	+ +
F. x *P.ČERVENE*	2.29 ± 0.26	0.14	6.43	+ +	+
F. x *DITMAR*	2.27 ± 0.22	0.12	5.53	+ +	+
F. x *KOPENHAŠKI*	2.24 ± 0.34	0.18	8.28	+ +	+
F. x *P.ŽETVA*	2.27 ± 0.45	0.25	11.1	+ +	+
F. x *SM-10*	2.69 ± 0.48	0.26	9.77	+	-
P.ČERVENE	1.10 ± 0.20	0.11	10.1		
P.Č. x *KJOSE*	2.19 ± 0.31	0.17	7.94	+ +	+ +
P.Č. x *FUTOŠKI*	2.18 ± 0.34	0.18	8.53	+ +	+ +
P.Č. x *DITMAR*	1.86 ± 0.24	0.11	6.20	+ +	+ +
P.Č. x *KOPENHAŠKI*	1.85 ± 0.45	0.24	13.3	+ +	+ +
P.Č. x *PRVA ŽETVE*	1.37 ± 0.30	0.16	12.2	+ +	+
P.Č. x SM-10	2.23 ± 0.39	0.21	9.72	+	+ +
DITMAR	1.35 ± 0.12	0.06	5.12		
D. x *KJOSE*	2.33 ± 0.37	0.20	8.9	+ +	+ +
D. x *FUTOŠKI*	2.42 ± 0.28	0.15	6.49	-	+ +
D. x *P.ČERVENE*	1.14 ± 0.17	0.09	8.41	-	+ +
D. x *KOPENHAŠKI*	1.16 ± 0.39	0.21	18.8	+	-
D. x *P.ŽETVA*	1.51 ± 0.31	0.17	11.4	+ +	-
D. x *SM-10*	1.58 ± 0.45	0.24	15.6	+ +	+
KOPENHAŠKI	1.48 ± 0.52	0.28	19.2		
K. x *KJOSE*	2.51 ± 0.21	0.11	4.7	+ +	+ +
K. x *FUTOŠKI*	2.40 ± 0.29	0.15	6.65	-	+ +
K. x *P.ČERVENE*	2.08 ± 0.19	0.10	5.15	+ +	+ +
K. x *DITMAR*	1.03 ± 0.36	0.19	19.2	+ +	+ +
K. x *PRVA ŽETVA*	1.64 ± 0.21	0.11	7.08	+ +	-
K. x *SM-10*	1.89 ± 0.46	0.25	12.7	+ +	+ +
PRVE ŽETVA	1.09 ± 0.17	0.09	8.66		
P.Ž. x *KJOSE*	2.24 ± 0.29	0.15	7.08	+ +	+ +
P.Ž. x *FUTOŠKI*	2.38 ± 0.30	0.16	7.05	-	+ +
P.Ž. x *DITMAR*	1.84 ± 0.40	0.22	12.1	+ +	+ +
P.Ž. x *P.ČERVENE*	1.01 ± 0.26	0.14	13.7	+ +	-
P.Ž. x *KOPENHAŠKI*	1.68 ± 0.27	0.14	8.88	-	+ +
P.Ž. x *SM-10*	2.01 ± 0.32	0.18	8.98	+ +	+ +
SM-10	2.42 ± 0.25	0.13	5.7		
SM. x *KJOSE*	2.62 ± 0.25	0.14	5.34	+ +	-
SM. x *FUTOŠKI*	2.16 ± 0.24	0.13	6.1	+ +	+
SM. x *P.ČERVENE*	1.90 ± 0.36	0.19	10.4	+ +	+ +
SM. x *DITMAR*	2.10 ± 0.35	0.19	9.2	+ +	+ +
SM. x *KOPENHAŠKI*	1.73 ± 0.34	0.18	10.8	+ +	+ +
SM. x *PRVA ŽETVA*	1.53 ± 0.28	0.15	10.2	+ +	+ +

LSD 0.05 = 0.09; 0.01 = 0.12

The smallest standard deviation was observed in Ditmar and the largest in Kopenhaški. The latter variety also had the largest coefficient of variation for head mass, while the former had the smallest (Table 1).

The head mass mean values of the F1 hybrids were the smallest in the combination of the early varieties Prva Žetva and Ditmar and the largest in Kjose x Futoški.

The variability of head mass in the F1 hybrids expressed as standard deviation (S) ranged from 0.09 in Ditmar x Pourovo Červene to 0.26 in Futoški x SM-10.

The coefficient of variation (V) ranged between 19.2 in Kopenhaški x Ditmar and 3.3 in Kjose x Futoški (Table 1).

Mode of inheritance of head mass - The most common mode of inheritance in the study was superdominance (23 instances). Heterosis relative to the better parent manifested itself 20 times, while that relative to the poorer parent was observed in only three cases. The foreign variety Kjose was where positive heterosis appeared the most. Positive heterosis occurred six times with Kjose as the female parent and five times with it as the male parent. The second most frequent mode of inheritance was partial dominance of the better parent (10 instances). Dominance of the poorer parent occurred only once (Prva žetva x Ditmar) and was the least common mode of inheritance for this trait (Figure 1).

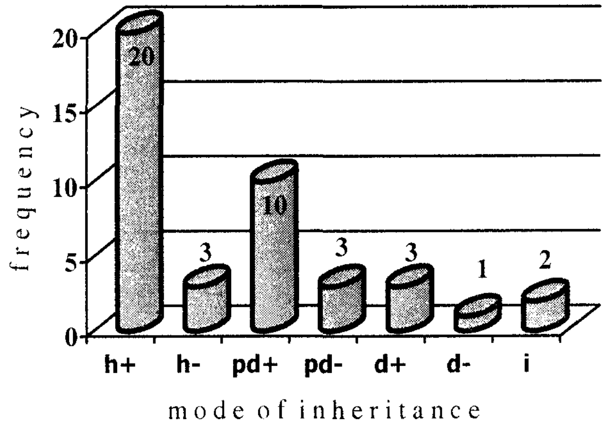

Fig. 1. Inheritance of head mass

Mean values and components of variability of the edible portion of the head - Having studied the parents' variability, the highest mean value of the edible portion of the head was found in the late variety SM-10 and the lowest in Pourovo Červene. This is only natural since SM-10 has twice as large a head mass as Pourovo Červene (Table 2).

The standard deviation value was the lowest in Pourovo Červene and the highest in Kopenhaški. The latter variety also had the highest coefficient of variation for this trait, while the early variety Ditmar had the lowest (Table 2).

Table 2 - Mean value (kg) and variability of usable part of cabbage head

Variety and F1 hybrids	$\bar{x} \pm S_{\bar{x}}$	S	CV	t-test	
				[illegible]	[illegible]
KJOSE	1.25 ± 0.40	0.22	17.5		
K. x FUTOŠKI	3.79 ± 1.26	0.40	3.81	+ +	+ +
K. x P.ČERVENE	1.68 ± 1.20	0.13	6.76	+ +	+ +
K. x DITMAR	2.08 ± 0.23	0.12	6.11	+ +	+ +
K. x KOPENHAŠKI	2.30 ± 0.35	0.19	8.42	+ +	+ +
K. x P.ŽETVA	1.50 ± 0.46	0.25	16.9	+ +	-
K. x SM-10	2.11 ± 0.40	0.21	10.3	-	+ +
FUTOŠKI	1.95 ± 0.38	0.20	10.7		
F. x KJOSE	2.64 ± 0.27	0.14	5.62	+ +	+ +
F. x P.ČERVENE	1.89 ± 0.25	0.14	7.44	+ +	-
F. x DITMAR	2.02 ± 0.22	0.12	6.15	+ +	-
F. x KOPENHAŠKI	1.93 ± 0.34	0.18	9.64	+ +	-
F. x P.ŽETVA	2.12 ± 0.46	0.25	11.9	+ +	-
F. x SM-10	2.36 ± 0.48	0.26	11.3	-	+ +
P.ČERVENE	0.90 ± 0.15	0.08	9.23		
P.Č. x KJOSE	1.90 ± 0.47	0.25	13.6	+ +	+ +
P.Č. x FUTOŠKI	1.85 ± 0.30	0.16	9.04	-	+ +
P.Č. x DITMAR	1.63 ± 0.21	0.11	7.34	+ +	+ +
P.Č. x KOPENHAŠKI	1.62 ± 0.44	0.24	14.9	-	+ +
P.Č. x PRVA ŽETVE	1.18 ± 0.54	0.29	24.8	-	+
P.Č. x SM-10	1.99 ± 0.49	0.26	13.4	+	+ +
DITMAR	1.20 ± 0.06	0.11	5.21		
D. x KJOSE	2.07 ± 0.20	0.37	9.85	+ +	+ +
D. x FUTOŠKI	2.13 ± 0.16	0.29	7.62	-	+ +
D. x P.ČERVENE	1.03 ± 0.10	0.18	9.70	-	+
D. x KOPENHAŠKI	1.01 ± 0.19	0.36	19.7	-	-
D. x P.ŽETVA	1.41 ± 0.17	0.31	12.0	+ +	+
D. x SM-10	1.44 ± 0.23	0.43	16.4	+ +	+
KOPENHAŠKI	1.38 ± 0.46	0.25	18.3		
K. x KJOSE	2.23 ± 0.21	0.11	5.26	+ +	+ +
K. x FUTOŠKI	2.19 ± 0.28	0.15	7.23	+	+ +
K. x P.ČERVENE	1.76 ± 0.19	0.10	6.13	+ +	+ +
K. x DITMAR	0.92 ± 0.35	0.19	20.9	+	+ +
K. x PRVA ŽETVA	1.49 ± 0.21	0.11	7.73	+ +	-
K. x SM-10	1.72 ± 0.46	0.25	14.7	+ +	+
PRVE ŽETVA	1.02 ± 0.17	0.09	9.11		
P.Ž. x KJOSE	1.98 ± 0.31	0.17	8.58	+ +	+ +
P.Ž. x FUTOŠKI	2.04 ± 0.58	0.32	15.6	-	+ +
P.Ž. x DITMAR	1.67 ± 0.41	0.22	13.4	+ +	+ +
P.Ž. x P.ČERVENE	0.93 ± 0.26	0.14	15.4	+ +	-
P.Ž. x KOPENHAŠKI	1.51 ± 0.28	0.15	10.4	-	+ +
P.Ž. x SM-10	1.78 ± 0.33	0.18	10.2	+ +	+ +
SM-10	2.24 ± 0.23	0.12	5.65		
SM. x KJOSE	2.31 ± 0.25	0.13	5.97	+ +	-
SM. x FUTOŠKI	1.98 ± 0.24	0.13	6.80	+	+
SM. x P.ČERVENE	1.69 ± 0.36	0.19	11.7	+ +	+ +
SM. x DITMAR	1.96 ± 0.34	0.19	10.2	+ +	+
SM. x KOPENHAŠKI	1.56 ± 0.34	0.18	11.8	-	+ +
SM. x PRVA ŽETVA	1.41 ± 0.28	0.15	11.1	+ +	+ +

LSD 0.05 = 0.09; 0.01 = 0.13

The mean values of this trait in the F1 hybrids varied significantly, ranging from 0.92 kg in Kopenhaški x Ditmar to 3.79 kg in Kjose x Futoški.

The variability of this trait expressed as standard deviation (S) ranged from 0.10 in Kopenhaški x Pourovo Červene to 0.43 in Ditmar x SM-10. The coefficient of variation (CV) varied from 3.81 in the F1 hybrid Kjose x Futoški to 24.8 in Pourovo Červene x Prva žetva. The hybrids had larger variability values of this trait than their parents (Table 2).

Mode of inheritance of the edible portion of the head - As in the previous case, the most common mode of inheritance of this trait was superdominance (21 instances). Positive heterosis occurred 19 times, most often in combinations involving the variety Kjose (10 times). Dominance of the poorer parent occurred only once — in SM 10 x Futoški. This mode of inheritance was the least common in this trait. The second most frequent mode was dominance of the better parent (10 instances) (Figure 2).

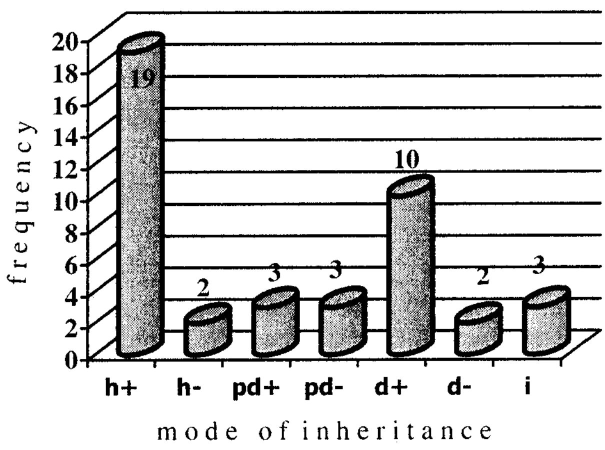

Fig. 2. Inheritance of edible portion of head

Mean values and componens of variability of yield - Among the parents, the highest yield was that of Kopenhaški and the lowest that of Pourovo Červene (Table 3).

The smallest standard deviation was found in SM-10 and the largest in Kopenhaški. Kopenhaški had the highest coefficient of variation for head yield, whereas Kjose had the lowest (Table 3).

In the F1 hybrids, the mean values of head yield ranged from 39 t/ha in Pourovo Červene x Prva žetva to 151 t/ha in Kjose x Ditmar (Table 3).

The variability of this trait expressed as standard deviation (S) varied from 0.38 in SM-10 x Futoški to 1.98 in Pourovo Červene x Kopenhaški. The coefficient of variation (V) ranged between 3.30% in the F1 hybrid Kjose x Futoški and 19.2% in Kopenhaški x Ditmar and was higher in the parents (Table 3).

Table 3 – Mean value (t/ha) and variability of cabbage yield

Variety and F1hybrids	$\bar{x} \pm S_{\bar{x}}$	S	CV	t-test	
				♀	♂
KJOSE	55 ± 1.72	0.94	1.69		
K. x *FUTOŠKI*	119 ± 0.72	0.39	3.30	+ +	+ +
K. x P.ČERVENE	80 ± 0.83	0.45	5.64	+ +	+ +
K. x *DITMAR*	151 ± 1.53	0.84	5.54	+ +	+ +
K. x *KOPENHAŠKI*	102 ± 1.40	0.76	7.42	-	+ +
K. x *P.ŽETVA*	103 ± 2.96	1.62	15.6	+ +	+ +
K. x *SM-10*	69 ± 1.13	0.61	8.93	-	+ +
FUTOŠKI	71 ± 0.72	0.40	6.19		
F. x *KJOSE*	121 ± 1.11	0.60	4.98	+ +	+ +
F. x *P.ČERVENE*	91 ± 1.07	0.59	6.43	+ +	+ +
F. x *DITMAR*	143 ± 1.45	0.79	5.53	+ +	+ +
F. x *KOPENHAŠKI*	141 ± 1.36	0.74	8.28	+ +	+ +
F. x *P.ŽETVA*	90 ± 1.84	1.06	11.1	+ +	+ +
F. x *SM-10*	107 ± 1.92	1.05	9.77	+ +	+ +
P.ČERVENE	44 ± 0.44	0.81	10.1		
P.Č. x *KJOSE*	62 ± 0.49	0.91	7.94	-	+ +
P.Č. x *FUTOŠKI*	87 ± 0.74	1.36	8.53	+ +	+ +
P.Č. x *DITMAR*	74 ± 0.46	0.84	6.20	+ +	+ +
P.Č. x *KOPENHAŠKI*	74 ± 0.98	1.95	13.3	+ +	+ +
P.Č. x *PRVA ŽETVE*	39 ± 0.48	0.88	12.2	+ +	-
P.Č. x SM-10	63 ± 0.61	1.13	9.72	+	+ +
DITMAR	85 ± 0.80	0.43	5.12		
D. x *KJOSE*	146 ± 2.38	1.30	8.86	+ +	+ +
D. x *FUTOŠKI*	96 ± 1.15	0.63	6.49	+ +	+ +
D. x *P.ČERVENE*	72 ± 1.11	0.60	8.41	+ +	+ +
D. x *KOPENHAŠKI*	73 ± 2.51	1.37	18.8	+ +	+ +
D. x *P.ŽETVA*	60 ± 1.26	0.69	11.3	+ +	+ +
D. x *SM-10*	99 ± 2.86	1.56	15.6	+ +	+ +
KOPENHAŠKI	93 ± 2.64	1.45	15.8		
K. x *KJOSE*	100 ± 0.86	0.47	4.71	+ +	-
K. x *FUTOŠKI*	69 ± 0.83	0.45	6.65	+ +	+ +
K. x *P.ČERVENE*	83 ± 0.78	0.43	5.15	+ +	+
K. x *DITMAR*	65 ± 2.30	1.55	19.2	+ +	+ +
K. x *PRVA ŽETVA*	65 ± 0.85	0.45	7.08	-	+ +
K. x *SM-10*	79 ± 1.85	1.01	12.7	+ +	+ +
PRVE ŽETVA	69 ± 1.08	0.59	8.66		
P.Ž. x *KJOSE*	89 ± 1.11	0.63	7.08	+ +	+ +
P.Ž. x *FUTOŠKI*	95 ± 1.23	0.67	7.05	+ +	+ +
P.Ž. x *DITMAR*	73 ± 1.62	0.89	12.0	+ +	-
P.Ž. x *P.ČERVENE*	41 ± 1.04	0.57	13.7	+ +	+ +
P.Ž. x *KOPENHAŠKI*	67 ± 1.09	0.59	8.88	+ +	-
P.Ž. x *SM-10*	57 ± 0.94	0.51	8.98	+ +	+ +
SM-10	69 ± 0.71	0.39	5.70		
SM. x *KJOSE*	74 ± 0.73	0.40	5.34	+ +	-
SM. x *FUTOŠKI*	61 ± 0.69	0.38	6.14	+ +	+ +
SM. x *P.ČERVENE*	54 ± 1.03	0.56	7.36	+ +	+ +
SM. x *DITMAR*	132 ± 2.22	1.21	9.19	+ +	+ +
SM. x *KOPENHAŠKI*	108 ± 2.16	1.18	10.8	+ +	+ +
SM. x *PRVA ŽETVA*	96 ± 1.81	0.88	10.2	+ +	+ +

LSD 0.05 = 4.12; 0.01 = 5.44

Mode of inheritance of yield - Heterosis was observed in the F1 generation of most of the combinations (22 times positive, seven times negative). Dominance manifested itself six times, three of which were a case of the dominance of the better parent and three the dominance of the poorer parent. Partial dominance occurred five times as well. The mode of inheritance found in the smallest number of combinations was intermediacy (Kopenhaški x SM-10 and SM-10 x P.Červene). In both these combinations the variety Srpski Melez appears as one of the parents (Figure 3).

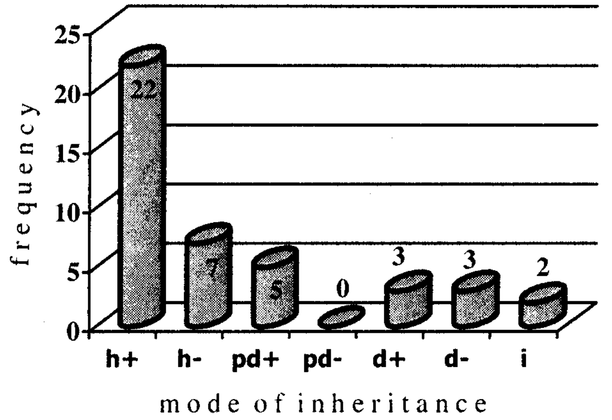

Fig. 3. Inheritance of yield

DISCUSSION

Head mass is one of the most important traits and it directly affects total yield per unit area. It is highly variable and dependant on a number of factors determining the growth and development of a cabbage head (ČERVENSKI *et al.*, 1994). SUMMERS *et al.* (1980) compared the mode of inheritance in green and red cabbages. Green x green crosses exhibited dominance of the larger head mass, while in the red x red crosses smaller and lighter heads were dominant ZHUK *et al.* (1981) report obtaining an average head mass of 3.3-4.1 kg in the varieties they chose for hybridization. In the present study, the genotypes had an average head mass of 1.01-4.12 kg, the hybrid combinations included. Similar results are reported by ARTEMEVA (1983), where the hybrids outperformed the parents with regard to head mass. In the present study the hybrids outperformed the parents, too, although not all of the combinations produced significant values. BAUCH *et al.* (1988) found that cabbage hybrids have a 15% larger head than the standard cabbage cultivars. Hybrids obtained by making combination crosses with the existing cultivars also had a larger head, although we did not study this particular finding using percentages but only using the significance test. MORE *et al.* (1988) found superdominance in the inheritance of head mass. Several dominant alleles were found for this trait and the study's results indicate that the trait is controlled by several genes. In KANDIĆ *et al.*, (1994), the most common mode of inheritance of head mass was the dominance of the better parent, followed by intermediacy. KANDIĆ *et al.*, (1994) further report that the mean value of the F1s for head mass was higher than the mean of their parents. In our research superdominance emerged as the most common mode of inheritance, while dominance was present in 11 of the hybrids. ARTEMEVA (1983) concluded that hybrids considerably outperform the parental forms with regard to head mass, among other things. BAUCH and NEUBERT (1988) found out that the hybrids outperformed the standards by 15% with respect to head mass. Superdominance was reported as the mode of inheritance of head mass by MORE and WALLACE (1988) as well. They reported that this trait is controlled by multiple genes. In KANDIĆ (1994), the best general combiner for head mass wasthe cultivar Futoški, followed by SM-10. In the present study, these two cuiltivars proved to be the best combiners as well. ARTEMEVA (1983) concluded that F1 hybrids are significantly better than the standards when it comes to early maturity, head mass and yield. Such results were also obtained in the present paper, which was to be expected given the heterogenous materials that were used.

Edible portion of the head - In the genotypes we use, the head is usually enveloped in two to three outer leaves, which fit snugly on the head itself. When these leaves and the inner core are removed, what is left is the edible portion of the head. It depends on the size and compactedness of the head, the number and size of the outer leaves, and the size of the core in the head, i.e. its thickness and length. Large, compact heads that have a smaller mass of the outer leaves and a small core will have a higher contribution of the edible part of the head (ČERVENSKI *et al.*, 1994). ČERVENSKI *et al.* (1995) report significant differences among the genotypes with regard to this trait. In the present study, too, there were differences among the values of this trait in the cultivars and hybrids alike.

Yield - Total yield per unit area is a product of the average head mass and the percentage of heads formed on a particular area (ČERVENSKI *et al.*, 1995). Yield is the main trait in breeding; a trait that all the other traits are ultimately subservient to. It is a quantitative trait controlled by a large number of genes and it varies the most as a result of environmental factors (GVOZDENOVIĆ *et al.*, 1996). According to PRASAD *et al.* (1988), yield is a complex entity composed of a number of interdependent traits, as pointed out by ČERVENSKI *et al.* (1998). The findings of SUMMERS and HOMMA (1980) that heavier heads were dominant in the crosses are in agreement with those of Hansen. Hansen also found that this trait depends on both additive and dominant gene effects. In the present study, positive heterosis was found in several combinations, which also indicates that larger head mass was of greater importance. The study confirmed the significance of reciprocal effects. Head formation and total head yield, despite being genetically determined, depend to a large extent on environmental and edaphic factors. If those factors are unfavorable, their adjustment can significantly increase the yield. ČERVENSKI *et al.*, (1994). RIGGS (1988) argues that yield per se must not be the only goal of cabbage breeding. Increased productivity, early maturity, uniformity and quality should be among the main criteria of selection. We fully agree with this proposition; all traits that affect yield formation must be taken into account during cabbage selection. SAROSHIMA and MATSUZAMA (1986) did a six-year study of the F1 hybrids of 16 Chinese cabbage cultivars and found that the hybrids outperformed the parents yield-wise. Hybrids from our study also outperformed the cultivars, and not only with regard to yield but also with respect to the other traits. A five-year study of hybrids and cultivars carried out by SILVE *et al.* (1987) showed the hybrids to be superior to the cultivars in terms of yield. This finding is supported by the heterosis values of our hybrids as well.

CONCLUSION

The main problem in cabbage production is a lack of uniformity in almost all traits. This problem can be resolved by substituting the existing cultivars with hybrids characterized by great uniformity. The first step in this process is the choice of the right parents from which self-incompatible lines to be used as the components of hybrids can be developed by breeding (RIGGS, 1988). In parallel with this, we are studying the combining ability of the seven cultivars that will be used to obtain the above lines in the next selection cycle.

Heterosis of plants of the genus Brassica sp. is used widely worldwide. The main procedure for obtaining the hybrid seed is based on self-incompatible or self-sterile plants obtained by cloning.

These studies can make a great contribution to use of heterosis in cabbage, but only if clone parent lines with the best SCA values and a high level of self-incompatibility are formed.

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NAČIN NASLEĐIVANJA PRINOSA I KOMPONENTI PRINOSA KOD KUPUSA (*BRASSICA OLERACEA* VAR. *CAPITATA* L.)

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Izvod

Sedam divergentnih sorti kupusa, dobijenih metom potpunog dijalelnog ukrštanja, korišćeno je u ovom istraživanju. Analizirana svojstva su važna za dalju selekciju i stoga su i izabrana. Dobijeni rezultati pokazuju da su svojstva značajno divergentna što predstavlja važan izvor varijabilnosti za sledeće cikluse selekcije. Superdominantnost je prevashodni način nasleđivanja mase glavice i jestivih delova glavice. Variranje ova dva svojstva bilo je značajno kako kod roditelja tako i kod hibrida što je i osnovni razlog razlike u ranostasnosti. Prinos se još jednom pokazao kao složeno svojstvo, koje podjednako varira kako kod roditelja tako i kod hibrida. Varijabilnost prinosa bila je mnogo veća kod hibrida nego kod kultivara. Superdominantnost se javila 23 puta.

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