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## Effect of head size on yield and quality of cabbage cv. PRIDE OF INDIA seed crop

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**Abstract :** The 45 days old healthy seedlings of cabbage cv. PRIDE OF INDIA were transplanted in the mid July at Vegetable Research Station, Kalpa, District Kinnaur (HP) and the heads overwintered in trenches from November to March during two consecutive years 2007-08 and 2008-09. Cabbage seed production was done by head to seed method and the compact true to type heads were grouped into seven classes viz., S<sub>1</sub>: 250-500g; S<sub>2</sub>: 500-750g; S<sub>3</sub>: 750-1000g; S<sub>4</sub>: 1000-1250g; S<sub>5</sub>: 1250-1500g; S<sub>6</sub>: 1500-1750g and S<sub>7</sub>: 1750-2000g including the weight of the stump. The experiment was planted in Randomized Block Design with three replications, after melting of snow in the last week of March to first week of April every year, at a spacing of 45 cm x45 cm having plot size of 2.70x2.25 m with a population of 30 plants per plot. Significant differences were observed for all the traits studied except seed quality and maturity during both the years. The plants from larger heads produced more seed yield, number of branches, pods, seeds per pod, pod length and height, besides, being early in sprouting, flowering and pod formation with low mortality. However, seed quality measured in terms of 1000 seed weight and germination percentage as well as days to maturity was not affected by the head size. It was concluded that compact heads weighing more than one kilogram should be selected for high seed yield in cabbage.

**Key words :** Cabbage, Head size, Seed yield, Quality, Pride of India, Seed crop

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Cabbage (*Brassica oleracea* var. *capitata*) is an important leafy vegetable grown extensively throughout the world. In India, it is cultivated as a winter crop. Cabbage is biennial in nature and its seed production is restricted to temperate areas concentrated at an altitude of 1500m to 3000m above sea level with dry weather during seed maturity and harvesting. In one season heads are produced which then require an exposure to cold treatment of 4-7<sup>o</sup> C for 6-8 weeks or more for entering into reproductive phase. The dry temperate zone of North Western Himalayas is congenial for seed production of cabbage. Head to seed method is generally followed where heads after selection along with roots are stored in trenches for overwintering and seed so produced is of high quality. Due to slow rise in temperature from March to August and prevalence of dry condition at the time of seed maturity and ripening, the seed produced in this region is of high quality and excellent vigour. However, there is wide variation with respect to head size, which may affect the seed yield and quality. The present studies were carried

out during two consecutive years 2007-08 and 2008-09 at Vegetable Research Station, Kalpa, District Kinnaur (HP) with the objective to know the optimum size of heads to be used for better yield and quality of cabbage seed. Since it is a long duration, location specific and labour intensive seed crop, efforts to maximize the seed yield per unit area will go a long way in increasing the seed yield and boosting the income of the tribal farmers.

### RESEARCH METHODS

The present investigations were carried out on cabbage cv. Pride of India during two consecutive years 2007-08 and 2008-09 at Vegetable Research Station, Kalpa, District Kinnaur (HP). The 45 days old healthy seedlings were transplanted in the mid July and the heads overwintered in trenches from November to March. Cabbage seed production was done by head to seed method and the compact true to type heads were grouped into seven classes viz., S<sub>1</sub>: 250-500g; S<sub>2</sub>: 500-750g; S<sub>3</sub>: 750-1000g; S<sub>4</sub>: 1000-1250g; S<sub>5</sub>: 1250-1500g; S<sub>6</sub>: 1500-

Table 1: Effect of irrigation and quality of fertilizer on yield and quality of okra

Irrigation	Yield (kg/ha)		Days to 50% anthesis		Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit shape index			
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009		
S <sub>1</sub> 250	21.88	23.03	17.16	22.60	3.38	1.67	1.98	1.78	8.58	8.28	1.66	1.61	22.00	23.37
S <sub>2</sub> 500	25.76	27.96	17.16	15.72	6.77	6.82	6.55	5.53	21.97	21.82	1.56	1.52	21.33	20.67
S <sub>3</sub> 750	28.11	27.19	21.65	18.11	19.02	9.27	9.76	21.67	23.77	8.07	8.27	8.77	18.67	18.00
S <sub>4</sub> 1000	37.72	32.52	33.62	27.35	22.85	22.10	23.33	28.77	27.69	8.76	8.96	8.77	15.00	17.87
CV	33.97	31.88	32.90	27.18	23.73	30.97	33.73	27.72	26.67	8.56	8.37	8.77	16.33	16.77
S <sub>5</sub> 500	37.12	32.82	33.77	22.36	27.77	20.82	20.33	29.59	29.77	9.07	8.97	8.96	15.67	15.00
S <sub>6</sub> 750	35.27	33.57	37.39	27.27	27.77	27.88	26.53	26.09	27.77	26.60	8.78	8.57	17.00	17.37
CV	30.82	29.25	30.07	19.52	19.53	10.79	10.76	25.78	27.37	8.53	8.27	8.30	17.95	17.50
C.D. (P < 0.05)	3.57	3.77	3.36	2.37	2.25	2.36	2.37	3.77	2.98	3.20	1.20	1.27	2.65	2.78

Table 2: Effect of irrigation and quality of fertilizer on yield and quality of okra

Irrigation	Yield (kg/ha)		Days to 50% anthesis		Fruit weight (g)		Fruit length (cm)		Fruit diameter (cm)		Fruit shape index				
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009			
S <sub>1</sub> 250	18.00	15.33	16.67	16.67	57.37	13.77	1.35	95.72	98.32	97.02	3.97	3.82	3.87	92.50	97.00
S <sub>2</sub> 500	17.33	13.33	13.83	15.00	53.87	10.38	1.35	116.86	121.87	119.37	3.78	3.88	3.83	95.25	93.00
S <sub>3</sub> 750	10.33	39.67	10.00	16.00	17.77	6.77	1.35	77.77	76.79	75.77	3.82	3.86	3.87	97.77	92.83
S <sub>4</sub> 1000	37.00	36.33	36.67	15.33	19.67	17.50	1.35	135.72	138.82	136.97	3.97	3.88	3.97	97.75	97.00
CV	36.67	35.67	36.77	17.33	12.00	13.77	1.35	137.29	137.97	136.70	3.82	3.87	3.85	93.83	97.83
S <sub>5</sub> 500	37.00	36.67	36.87	16.00	15.33	15.67	1.35	139.77	141.57	140.78	3.88	3.82	3.85	92.58	93.07
CV	36.67	36.00	36.37	17.67	13.33	17.00	1.35	137.32	132.72	137.72	3.90	3.92	3.97	93.25	97.50
CV	10.00	39.00	39.50	18.57	17.93	17.93	1.35	126.77	131.00	128.59	3.86	3.86	3.86	93.33	92.92
C.D. (P < 0.05)	1.57	3.92	1.23	1.18	1.57	2.77	NS	11.62	10.19	10.97	NS	NS	NS	NS	NS

1750g and  $S_7$ : 1750-2000g including the weight of the stump. Loose and non-heading plants were rejected for seed production. The experiment was planted in Randomized Block Design with three replications every year, after melting of snow in the last week of March to first week of April, at a spacing of 45x45 cm having plot size of 2.70x2.25 m with a population of 30 plants per plot. The observations were recorded on seed yield per plant (g), number of branches per plant, pods per plant, seeds per pod, pod length (cm), days to 50 per cent sprouting, flowering, pod formation, maturity, mortality (%), plant height (cm), 1000 seed weight (g) and seed germination (%).

## RESEARCH FINDINGS AND DISCUSSION

Seed yield, yield components, morphological, maturity and seed quality traits under different head sizes were statistically analyzed and the mean values for two years along with the pooled means are presented in Table 1. Significant differences were observed for all the traits studied except seed quality measured in terms of 1000 seed weight and germination percentage, besides, days to maturity during both the years.

The highest seed yield of 34.39g per plant was obtained by replanting the compact heads of 1750-2000g size, however, it was at par with all other heads weighing above 1000g, whereas, the performance of heads below 1000g was significantly poor in individual years as well as under pooled performance. Almost similar trend was observed for branches per plant, pods per plant, seeds per pod, pod length and plant height. The maximum number of branches per plant (21.47), seeds per pod (29.14) and pod length (8.96 cm) were observed in 1500-1750g size, similarly the maximum number of pods per plant (1266.53) and plant height (144.72 cm) were recorded in 1750-2000g, which were at par with all other heads weighing above 1000g, the performance of smaller heads was poor. Pathania and Negi (1993) also observed higher seed yield, number of branches per plant and plant height from large sized heads, however, the differences for seed yield and plant height were non-significant. Arya *et al.* (1983) also reported that large sized heads produced significantly higher seed yield, number of branches and pods per plant and numerically higher plant height. Increased seed yield parameters with head size were also confirmed by Verma *et al.* (1996) and Kanwar *et al.* (2001).

The heads larger than 1000g sprouted, flowered and came into pod formation stage significantly earlier than the smaller ones and also their mortality percentage was low. The cabbage seed plants from head size 1750-2000g

sprouted at the earliest (14.34 days) followed by heads larger than 1000g, whereas, those from head size 1250-1500g flowered (36.17 days) and came into pod formation stage (43.17 days) at the earliest followed by heads larger than 750g. The minimum mortality (1.93%) was observed in the plants from head size 1250-1500g which was statistically at par with those from head size larger than 1000g. Arya *et al.* (1983) also reported that large sized heads exhibited significantly early sprouting, flowering and pod formation as well as low mortality. The early flowering in case of large sized heads was also confirmed by Pathania and Negi (1993) and Kanwar *et al.* (2001). Bosewell (1929) reported that size of overwintered cabbage head is the primary cause of premature bolting. The mortality in case of large sized heads was negligible perhaps due to the fact that the floral buds are covered by large number of leaves which protect it from low and sudden changes in temperature.

In order to ascertain the effect of head size on the quality of seed, 1000 seed weight and seed germination percentage were recorded and the differences for both the traits were found non-significant in all the years. A rang of 3.83-3.91g for 1000 seed weight and 92.50-94.00 per cent for seed germination was recorded in all the head sizes used. Seed germination from all root sizes was considerably higher due to low rainfall at seed maturation and harvesting. Arya *et al.* (1983) also reported that the quality of seed measured in terms of 1000 seed weight and seed germination percentage did not show any significance with regard to head size. However, Verma *et al.* (1996) and Kanwar *et al.* (2001) observed that the seed quality in terms of germination percentage generally improved with increasing head size.

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