

Effect of Planting Techniques and Leaf Cuttings on Seed Yield of Chinese Cabbage (*Brassica campestris* var. *chinensis*)

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ABSTRACT Studies were conducted at Seed Technology Farm, Punjab Agricultural University, Ludhiana to find out the effect of planting techniques and leaf cuttings on seed production of non-heading Chinese cabbage. There were 32 treatments comprising of eight planting techniques *viz.* direct seed sowing on flat bed (M_1), direct seed sowing on flat bed followed by earthing up (M_2), direct seed sowing on ridges (M_3), direct seed sowing on ridges followed by earthing up (M_4), transplanting of seedlings on flat bed (M_5), transplanting of seedlings on flat bed followed by earthing up (M_6), transplanting of seedlings on ridges (M_7), transplanting of seedlings on ridges followed by earthing up (M_8) as main plot treatment and four levels of leaf cuttings *viz.* no cutting (C_0), one cutting (C_1), two cuttings (C_2) and three cuttings (C_3) as sub plot treatment and there were 3 replications. Among planting techniques, maximum number of branches per plant (10.9), number of pods per plant (1404.3), number of seed per pod (21.0) and seed yield per hectare (11.5 q/ha) were recorded in direct sown on ridges followed by earthing up (M_4) and minimum lodging per cent (4.2) was recorded in transplanted on ridges followed by earthing up (M_8) planting technique. Among leaf cutting treatments, maximum number of branches per plant (11.1) and number of pods per plant (1298.3) were recorded in no leaf cutting treatment whereas maximum number of seed per pod (20.5) and seed yield per hectare (10.1 q/ha) were recorded in one leaf cutting treatment. Minimum lodging per cent (2.9) was observed in three-leaf cuttings treatment.

Key words: Planting techniques, leaf cuttings, Chinese cabbage, seed yield

Chinese cabbage is an important leafy vegetable used as an ingredient of a salad or as cooked vegetable in India and abroad. In Punjab, it is grown for quality 'saag' due to its tender and succulent leaves. Mostly grown for their seeds, from which edible oils are extracted [1]. Planting technique is an important agronomic practice influencing the crop yield through its impact on utilization of inputs, phenophasic development and economic yield. Similarly, the leaf cuttings though add to the total income obtained from the crop, yet may adversely affect the seed yield. The present study, therefore, aimed at investigating the effect of planting techniques, leaf cuttings and their interactions on seed production of Chinese cabbage.

MATERIALS AND METHODS

A field experiment was conducted at Seed Technology Farm, Punjab Agricultural University, Ludhiana during *rabi* season of 2005-06. There were 32 treatments consisted of eight levels of planting techniques *viz.* direct seed sowing on flat bed (M_1), direct seed sowing on flat bed followed by earthing up (M_2), direct seed sowing on ridges (M_3), direct seed sowing on ridges followed by earthing up (M_4), transplanting of seedlings on flat bed (M_5), transplanting of seedlings on flat bed followed by earthing up (M_6), transplanting of seedlings on ridges (M_7), transplanting of seedlings on ridges followed by earthing up (M_8) as main plot treatment and four levels of leaf cuttings *viz.* no cutting (C_0), one cutting (C_1), two cuttings (C_2) and three cuttings (C_3) as sub plot treatment. The crop was sown

in the field in second fortnight of September 2005 in split plot design with three replications. The nursery was also simultaneously sown on the same day. Thirty days old seedlings were transplanted as per treatment in the field. The plot size was 2.25 m x 1.75 m. Earthing up was done 40 days after sowing (10 days after transplanting) as per treatments. First leaf cutting was taken 50 days after sowing and 2nd and 3rd cuttings were taken 15 and 30 days after 1st cutting, respectively. Observations were recorded on seed yield and its attributes.

RESULTS AND DISCUSSION

Data presented in Table 1 show that planting techniques, leaf cuttings and their interactions had significant effect on number of branches and number of pods per plant. Maximum number of branches and number of pods per plant (10.9 and 1404.3 respectively) were produced in M₄ (direct sown on ridges followed by earthing up). This might be due to better plant growth on ridges. The results were in line with the findings of Randhawa [2] in soybean who reported that ridge sowing recorded significantly higher pod bearing branches, pods per plant and seeds per pod *vis-a-vis* other methods.

Number of cuttings greatly influenced the seed yield attributes. The maximum number of branches (11.12) and number of pod per plant (1298.3) were produced in treatment (C₀) i.e. no leaf cutting. This might be due to the fact that increase in number of leaf cuttings reduced the plant height and plant spread and hence number of branches and number of pod per plant. Korla and Saini [3] also reported similar trend in fenugreek.

Planting techniques and leaf cuttings had significant effect on number of seed per pod where as their interactions had non-significant effect (Table 2). Maximum number of seeds per pod (21.0) were obtained in M₄ planting technique, which was significantly better than M₅, M₆, M₇ and M₈ but was at par with M₁, M₂ and M₀. The number of seeds per pod were more in the direct sown techniques than in transplanted techniques. This might be due to greater accumulation of photosynthates (because of more

vigorous plants) in direct sown techniques.

The maximum number of seeds per pod (20.5) were obtained in C₁ treatment and it was at par with C₀. Better vegetative growth due to more number of leaves in one cutting and no cutting treatments contributed towards more photosynthesis which resulted in higher dry matter accumulation thereby increasing the number of seeds per pod. The results confirm the findings of Thapa and Maity [4] in fenugreek. Less number of seeds per pod in C₂ and C₃ could be due to the fact that leaf cuttings increased the vegetative phase and reduced the juvenile phase of the plant and sudden rise in temperature had detrimental effects on seed setting and seed development.

Data presented in Table 2 show that planting techniques, leaf cuttings and their interactions had significant effect on lodging per cent. Lodging due to wind velocity was found maximum (21.3%) in M₁ and minimum in M₈ (4.2%) planting techniques (Table 2). It was observed that earthing up, reduced the lodging by more than 50 per cent. Ridge planting was also found effective in reducing the lodging as it provides support to the plant. The results were in conformity with the findings of Sakai and Munemura [5] in soybean. The lodging was reduced significantly with increased number of leaf cuttings. Maximum lodging (18.8%) was recorded in no cutting treatment whereas minimum (2.9%) was recorded in the crop where three leaf cuttings were taken.

Planting techniques, leaf cuttings and their interactions had significant effect on seed yield (Table 2). Direct sown techniques gave higher seed yield per hectare than transplanted techniques. Seed yield was highest (11.5 q/ha) in M₄ (direct sown on ridges followed by earthing up) whereas lowest seed yield (7.6 q/ha) was observed in M₅ (transplanted on flat bed). The highest seed yield in M₄ and lowest in M₅ can be attributed to the difference in number of branches per plant, number of pods per plant and number of seed per pod. Kedar and Rajagopal [6] also recorded maximum seed yield in direct sown crop in amaranth. The results showed that the highest seed yield (10.1 q/ha)

Table 1. Effect of planting techniques and leaf cuttings on number of branches and number of pods per plant of Chinese cabbage cv. Chinese Sarson no. 1

Planting techniques(M)	Number of branches per plant Leaf cuttings (C)			Mean	Number of pods per plant Leaf cuttings (C)			Mean		
	C ₀	C ₁	C ₂		C ₃	C ₀	C ₁		C ₂	C ₃
	M ₁	11.7	11.0		10.0	10.0	10.7		1479.3	1538.7
M ₂	11.3	10.3	10.3	10.3	10.6	1552.0	1467.7	1289.3	1238.0	1386.8
M ₃	12.0	9.7	10.0	9.7	10.3	1493.0	1279.3	1199.0	1197.3	1292.2
M ₄	12.3	11.3	10.0	10.0	10.9	1567.7	1417.7	1319.7	1312.0	1404.3
M ₅	11.3	10.3	9.3	8.7	8.9	1077.7	1051.0	915.3	756.7	950.2
M ₆	9.7	9.7	9.7	9.7	9.7	1026.0	1068.3	840.0	854.0	947.1
M ₇	10.0	9.7	9.7	9.3	9.7	1028.7	931.7	863.3	816.3	910.0
M ₈	10.7	10.0	9.7	9.3	9.9	1161.7	1230.0	953.0	775.7	1030.08
Mean	11.1	10.3	9.8	9.6		1298.3	1248.0	1101.0	1014.0	

CD (p = 0.05)

Planting techniques (M)

Leaf cuttings (C)

Planting techniques x Leaf cuttings (M x C)

Abbrev: M₁-Direct sown on flat bedM₂-Direct sown on flat bed followed by earthing up (40 DAS)M₃-Direct sown ridgesM₄-Direct sown on ridges followed by earthing up (40 DAS)

Number of branches

0.4

0.4

1.1

Numbers of pods

121.2

41.6

117.8

M₅-Transplanting on flat bedM₆-Transplanting on flat bed followed by earthing up (10 DAT);M₇-Transplanting on ridgesM₈-Transplanting on ridges followed by earthing up (10 DAT)

DAS-Days after sowing, DAT-Days after transplanting

Table 2. Effect of planting techniques and leaf cuttings on number of seeds per pod, lodging percentage and seed yield of Chinese cabbage cv. Chinese Sarson no. 1

Planting techniques(M)	Number of seed per pod Leaf cuttings (C)			Mean	Lodging per cent Leaf cuttings (C)			Mean	Seed yield (q/ha) Leaf cuttings (C)			Mean			
	C ₀	C ₁	C ₂		C ₃	C ₀	C ₁		C ₂	C ₃	C ₀		C ₁	C ₂	C ₃
M ₁	20.5	21.0	20.1	19.3	20.2	38.3	25.0	15.0	6.7	21.3	10.2	10.5	9.0	8.0	9.4
M ₂	20.5	21.1	20.5	19.4	20.3	21.7	11.7	3.3	0.0	9.2	11.7	12.5	11.0	10.2	11.3
M ₃	21.0	20.6	20.1	19.2	20.2	26.7	15.0	10.0	5.0	14.2	10.3	12.0	10.2	8.8	10.3
M ₄	21.1	22.9	20.7	19.4	21.0	16.7	10.0	8.3	0.0	8.8	11.7	12.9	12.0	9.3	11.5
M ₅	19.6	19.2	19.0	17.9	18.9	16.7	11.7	6.7	3.3	9.6	8.3	8.0	7.3	6.9	7.6
M ₆	19.8	19.8	19.0	18.4	19.2	8.3	6.7	5.0	3.3	5.8	8.5	8.6	7.8	7.1	8.0
M ₇	19.6	19.3	18.9	18.8	19.2	15.0	11.7	8.3	3.3	9.6	8.5	8.1	7.5	6.8	7.7
M ₈	20.4	20.0	18.8	18.6	19.4	6.7	5.0	3.3	1.7	4.2	8.5	8.5	8.1	7.6	8.2
Mean	20.3	20.5	19.6	18.9	18.8	12.1	7.5	2.9	2.9	9.7	10.1	9.1	8.1	8.1	8.1
CD (p = 0.05)				Number of seeds				Lodging percentage				Seed yield			
Planting techniques (M)				0.9				2.91				0.82			
Leaf cuttings (C)				0.4				2.50				0.37			
Planting techniques x Leaf cuttings (M x C)				NS				7.05				1.04			
Abbrev:				M ₁ -Direct sown on flat bed				M ₅ -Transplanting on flat bed							
				M ₂ -Direct sown on flat bed followed by earthing up (40 DAS)				M ₆ -Transplanting on flat bed followed by earthing up (10 DAT);							
				M ₃ -Direct sown ridges				M ₇ -Transplanting on ridges							
				M ₄ -Direct sown on ridges followed by earthing up (40 DAS)				M ₈ -Transplanting on ridges followed by earthing up (10 DAT)							

DAS-Days after sowing, DAT-Days after transplanting

was recorded in one leaf cutting treatment. The less seed yield in C_0 than C_1 might be due to more lodging per cent in C_0 . Ranpise *et al.* [7] also observed the maximum seed yield in one leaf cutting in beet leaf.

From the study, it is inferred that for obtaining maximum seed yield in Chinese cabbage, the crop should be directly sown on ridges followed by earthing up and one leaf cutting should be taken after 50 days of sowing.

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