

Influence of Time of Planting and Spacing on Growth and Yield of Knol-Khol (*Brassica oleracea* Var *gongylodes*)

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Abstract

A field experiment was carried out to study the influence of time of planting (October and January) and spacing (20 × 30, 20 × 45, 30 × 45, 30 × 30 and 30 × 45 cm) on growth and yield of Knol-khol. The seedlings transplanted in October resulted in 50% knob initiation within 22.3 days at a wider spacing of 30 × 45 cm while as December planting took 38 days for 50% knob initiation at the same spacing. The October transplanting of seedlings recorded highest yield (495 q/ha) at high density planting i. e. 30 × 15 cm as compared to January transplanting. The bigger sized knobs were obtained at wider spacing while at closer spacing the knobs were elongated.

Key words : Growth, Yield, Planting time, Spacing, Knol-khol.

Knol-khol (*Brassica oleracea* var *gongylodes*) a member of Brassica family is most nutritive cole crop rich in minerals and vitamins. It is well known leafy vegetable whose leaves and knobs are cooked or used in preparation of soups and pickles. It is rich in dietary fiber and endowed with anti colon cancer properties. Being short duration crop and conducive agro-climatic conditions available in Jammu region this crop can be cultivated throughout the year. In Jammu region it covers an area of 2,660 ha with annual production of 45,220 metric tons (1). Earliness and yield are the important characteristics to increase the production, keeping this in view, the present study was undertaken to optimize the sowing time and spacing of the crop.

Methods

The present study was undertaken during autumn and winter season of 2006 and 2007 at Vegetable Experimental Farm of Sher-E-Kashmir University of Agricultural Sciences & Technology of Jammu. The experimental farm is situated at an elevation of 900 m a.m.s. l. at 74°24' and 75°18' east longitude and 32°33' and 33°33' north latitude. The nursery of knol-khol was raised on 6 September and 1 December during both the years and seedlings were transplanted

on 4 October and 3 January during the two consecutive years. The trial was laid out in a randomized block design with three replicates maintaining a plot size of 3.0 × 2.0 m. The treatments comprised two planting dates i. e. 4 October and 3 January and five spacings viz. 20 × 30, 20 × 45, 30 × 15, 30 × 30 and 30 × 45 cm thereby having 10 treatment combinations. The crop was raised based on the recommended package and practices. The observations were recorded on various growth and yield contributing parameters viz. plant height, number of leaves, leaf length, leaf width, plant spread, leaf width, plant spread, leaf weight, knob diameter, yield per plot and per hectare were recorded. The data of two years was pooled and analyzed following the procedure given by Panse and Sukhateme (2).

Results and Discussion

Effect of Plant Spacing

Significant variations were recorded with different plant spacing in growth and yield contributing parameters (Tables 1 and 2). The plants grew taller with narrow spacing as compared to wider spacing. The maximum (50.4 cm) plant height and minimum plant spread (87.0 cm) were observed with closer spacing

Table 1. Influence of time of planting and spacing on the growth and yield knol-khol (*Brassica Oleracea* var *gongylodes*).

Treatment	Plant height (cm)			No. of leaves			Leaf length (cm)		
	Oct	Jan	Mean	Oct	Jan	Mean	Oct	Jan	Mean
T ₁ = 20 × 30	52.1	44.3	48.2	9.87	12.20	11.03	46.5	39.5	43.00
T ₂ = 20 × 45	50.5	45.8	48.1	10.20	13.74	11.97	46.9	42.2	44.5
T ₃ = 30 × 15	52.8	48.0	50.4	9.53	11.89	10.71	43.5	38.2	41.3
T ₄ = 30 × 30	50.6	44.1	47.3	9.80	12.20	11.00	43.3	38.9	41.1
T ₅ = 30 × 45	48.8	45.7	42.2	10.07	12.42	11.24	40.8	40.2	40.5
CD 5%	4.46	7.67		2.28	1.52		0.21	0.23	

Table 1. Continued.

Treatment	Leaf width (cm)			Plant spread			Days to 50 % knob initiation		
	Oct	Jan	Mean	Oct	Jan	Mean	Oct	Jan	Mean
T ₁ = 20 × 30	17.6	14.5	16.0	123.8	62.6	93.2	30.3	43.0	36.6
T ₂ = 20 × 45	19.3	15.6	17.4	126.8	64.2	95.5	34.3	49.0	41.6
T ₃ = 30 × 15	18.7	14.5	16.6	116.7	57.3	87.0	30.3	68.0	49.6
T ₄ = 30 × 30	18.0	13.8	15.9	134.1	60.0	97.5	53.3	43.0	46.6
T ₅ = 30 × 45	18.8	15.2	17.00	128.9	64.6	66.7	22.3	38.0	30.5
CD 5%	0.12	0.11		1.7	0.92		7.4	8.1	

of 30 × 15 cm during both the years of study. Since the plant density was higher at closer spacing, which resulted in greater competition for space and light among plants and plants became taller. However, significant increase in growth parameters was recorded with the increase in spacing of the plants during both the seasons. The maximum number of leaves (11.97), leaf length (44.5 cm.), leaf width (17.4 cm) were recorded with wider plant spacing of 20 × 45 cm. (Table 1). The increase in these parameters might be due to the reason that at wider spacing the plants were able to exploit their full potential with the availability of proper light and nutrient resources present in the soil during both the years. The trend of present study is in agreement with the findings of Papodopoulos and Ornrod (3)

Days taken to 50% knob initiation depicted the earliness in knol-khol. At a wider spacing of 30 × 45 cm the knobs were early to mature and took 30.5 days for 50% knob initiation as compared to closer spacing of 30 × 15 cm which recorded 49.6 days (Table 2). Similar effect of spacing on knob initiation had been reported by Fawusi (4). The yield contributing traits like knob diameter, knob weight and leaf weight were

significantly influenced by wider spacing. The highest knob diameter (6.20 cm), knob weight (97.5g) and leaf weight (127.5 g) were observed with plant spacing of 30 × 45 cm. This increase might be due to less competition among plants for nutrients and better environmental conditions which enhanced more availability of nutrients, moisture and light for higher photosynthetic efficiency.

The yield per plot and per hectare was significantly affected by different plant spacing. As inter and intra row spacing were increased there was significant reduction in the yield during both the seasons. The highest mean yield (330 q) per hectare was recorded at a closer spacing of 30 × 15 cm whereas lowest yield (185 q) with wider spacing of 30 × 45 cm during both the seasons. The increase in yield per hectare with plant spacing of 30 × 15 cm might be due to density with the closer spacing. These findings are closely supported by Gormley and Mahr (5) while working on tomato crop.

Effect of Planting Season

The growth and yield traits were significantly

Table 2. Influence of time of planting and spacing on the growth and yield of knol-khol (*Brassica oleracea* var *gongylodes*).

Treatment	Knob diameter (cm)			Knob weight (g)			Leaf weight (g)	
	Oct	Jan	Mean	Oct	Jan	Mean	Oct	Jan
T ₁ = 20 × 30	6.91	5.27	6.09	86.0	65.0	75.50	124.0	93.0
T ₂ = 20 × 45	6.42	5.21	5.81	92.0	77.0	84.5	125.0	102.0
T ₃ = 30 × 15	6.37	5.04	5.70	80.0	62.0	71.0	143.0	104.0
T ₄ = 30 × 30	6.40	5.10	6.00	118.0	75.0	96.5	139.0	103.0
T ₅ = 30 × 45	7.11	5.30	6.20	120.0	75.0	97.0	169.0	86.0
CD 5%	0.58	0.21		15.4	8.9		7.5	6.2

Table 2. Continued.

Treatment	Mean	Wt./plant (g)		Yield/ha (g)			
		Oct	Jan	Mean	Oct	Jan	Mean
T ₁ = 20 × 30	108.5	210.0	158.0	179.0	333.0	221.0	277.0
T ₂ = 20 × 45	113.5	217.0	179.0	198.0	241.0	209.0	225.0
T ₃ = 30 × 15	123.5	223.0	166.0	194.5	495.0	265.0	330.0
T ₄ = 30 × 30	121.0	259.0	178.0	218.5	288.0	214.0	251.0
T ₅ = 30 × 45	127.5	289.0	161.0	221.5	212.0	158.0	185.0
CD 5%		24.0	20.2		99.5	58.7	

affected by the planting dates. The transplanting of knoll-khol in October recorded maximum growth and yield parameters as compared to January transplanting during both the years of study (Tables 1 and 2). The maximum plant height (52.8 cm), leaf length (46.9 cm), leaf width (19.33 cm) were observed when the plants were transplanted on 4 October during both the years. These results are in close conformity with those of Singh et al. (6) who have also reported that growth is reduced if the plants transplanted late. The higher values for plant spread (134.1 cm) were observed in October planting as compared to January planting which recorded lower (64.6 cm) plant spread. These findings are in agreement with the findings of Singh et al. (6).

Days taken to 50% knob initiation were significantly influenced by the time of planting. When the crop was transplanted October it took (22.3 days) to 50% knob initiation and the crop was early as compared to late planting i.e. January planting took (38.00 days) to knob initiation. This might be due to the reason that in the late planting the temperature was low, which might have slowed down the activities of nutrient translocation and other food material to the

plants and there was delay in knob initiation (Table 2). Similar findings have been reported by Pandey et al. (7) in cauliflower.

The maximum knob diameter (7.11 cm), knob weight (118.00 g), leaf weight (169.00 g) were recorded when the crop was transplanted in October as compared to January planting. Similarly the highest yield (495 q) per hectare was also recorded when the crop was transplanted in October. The reason for highest yield might be that crop received favorable weather conditions and plants accumulated more photosynthates and all the vegetative parameters were increased in October planting which ultimately affected the yield. These findings coincide with those of Singh et al. (8) who reported that vegetable crops are much responsive to the time of planting.

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