

## Original Research Article

# Study on Effect of Spacing and Nitrogen Application on Growth and Yield of Knol-khol (*Brassica oleracea* var. *gongylodes* L.)

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## ABSTRACT

The field experiment was conducted during *rabi* season, 2016-17 on study of spacing and nitrogen application on growth and yield of Knol-khol (*Brassica oleracea* var. *gongylodes* L.) at the department of horticulture, college of agriculture, Dapoli, dist. Ratnagiri. The experiment was laid out on Factorial Randomized Block Design with three replications. From the data it was found that spacing 30×40 cm recorded maximum plant height (41.18 cm) number of leaves (16.66), plant spread (52.54 cm), vertical length of knob (8.66 cm), average diameter of knob (6.17 cm) whereas, maximum yield per plot (13.16 kg) and yield per hectare (34.81 ton) was recorded at spacing 30×20 cm. Application of nitrogen level through 120:50:50 kg NPK/ha recorded the maximum plant height (39.87 cm), number of leaves (16.22), plant spread (15.04 cm), vertical length of knob (8.08 cm), average diameter of knob (5.70 cm), yield per plot (10.35 kg) and yield per hectare (27.38 ton). The interaction effect of spacing 30×40 cm and nitrogen level 120 kg/ha recorded maximum plant height (43.29 cm), number of leaves (16.83), plant spread (53.70 cm), vertical length of knob (8.97 cm), average diameter of knob (6.40 cm) whereas, maximum yield per plot (14.01 kg) and yield per hectare (37.05 ton) was recorded at spacing 30×20 cm and nitrogen level 120 kg/ha.

### Keywords

Knol-khol,  
Spacing, Nitrogen  
levels, Growth and  
yield

## Introduction

Knol-khol (*Brassica oleracea* var. *gongylodes* L.) is a winter season crop belongs to the family cruciferae and is originated from the coastal countries of Mediterranean region. The bulb like swollen edible portion is stem known as knob, which arises from thickening of stem tissues above the cotyledon. Leaves are attached on this bulb like swollen structure. Keeping adequate plant population per unit area, knol-khol is most important for its better growth on higher yield. The spacing of crop may be varied according to climatic conditions, soil fertility and cultivars adaption to particular region. Under the wider

spacing, the plant was more vigorous in terms of leaf size, which might be due to less competition for light, nutrients and moisture as compared to closer spacing (Rai *et al.*, 2003). Knol-khol is a heavy feeder and shows good response to fertilizer application. Balanced dose of nitrogen play an important role in improving productivity and quality of knol-khol. Nitrogen increases vigour of plant, assimilation area and size of knob (Rai *et al.*, 2003). Knol-khol crop is gaining commercial importance especially under South Konkan conditions. However, so far very limited attempts have been made to study the various production practices for knol-khol in Konkan

agro-climatic conditions. It is high time to recommend the spacing as well as nitrogen levels for commercial conditions of knol-khol.

## **Materials and Methods**

This research was carried out at department of horticulture, dapoli of Dr. Balasaheb Sawant konkankrishividyapeeth, Dapoli during rabi-summer season of 2016-2017. The experimental plot was having lateritic loamy soil with uniform depth and good drainage. Nine treatment combinations consisting of three spacing viz., S<sub>1</sub>: 30 cm x 20 cm, S<sub>2</sub>: 30 cm x 30 cm, S<sub>3</sub>: 30 cm x 40 cm and three nitrogen levels viz., N<sub>1</sub>: 80 kg/ha, N<sub>2</sub>: 100 kg/ha, N<sub>3</sub>: 120 kg/ha, were laid out in Factorial Randomized Block Design in 3 replications keeping spacing in main plot and nitrogen levels in sub plot. Uniform dose of 50 kg P<sub>2</sub>O<sub>5</sub> and 50 kg K<sub>2</sub>O was applied in whole experiment area as basal dose through single super phosphate and murate of potash respectively. Nitrogen as per treatment applied through urea, half at time of transplanting, 1/4<sup>th</sup> at 21 days after transplanting and 1/4<sup>th</sup> at 42 days after transplanting. The knol-khol variety "White vienna" was sown in flat beds as per treatments. Plants were irrigated daily through sprinkler irrigation. Intercultural operations like weeding and earthing up was carried out regularly at an interval of 15 days. To evaluate the effect of treatments on crop, various growth and yield characters of knol-khol were recorded.

## **Results and Discussions**

### **Growth attributes**

The effect of spacing on plant height, no. of leaves and plant spread was found significant. The highest plant height (41.18 cm), no. of leaves (16.66), plant spread (52.54 cm) was

recorded in 30×40 cm spacing. Similar results were recorded by Mansa (2017) in red cabbage, Kakani (2012) in cauliflower, Malviya (2017) in broccoli and Haque *et al.*, (2015) in cabbage whereas, the effect of spacing on average leaf area was found non-significant.

Among nitrogen levels, the effect of nitrogen on plant height, no. of leaves and plant spread was found significant. The highest plant height (39.87 cm), no. of leaves (16.22) and plant spread (51.04 cm) was recorded in 120 kg/ha nitrogen. Similar results were recorded by Mansa (2017) in red cabbage, Kakani (2012) in cauliflower and Haque *et al.*, (2015) in cabbage whereas, the effect of nitrogen on average leaf area was found non-significant.

The interaction effect of spacing and nitrogen level on plant height, number of leaves, plant spread was found significant. The highest plant height (43.29 cm), number of leaves (16.83) and plant spread (53.70 cm) was recorded at spacing 30×40 cm and nitrogen level 120 kg/ha. Similar result reported by Mansa (2017) in red cabbage and Kakani (2012) in cauliflower. Whereas, the interaction effect on average leaf area was found non-significant.

### **Yield and yield attributing characters**

The effect of spacing on vertical length of knob, average diameter of knob, yield per plot and yield per hectare was found significant. The highest vertical length of knob (8.66 cm) and average diameter of knob (6.17 cm) was recorded in 30×40 cm spacing. Similar result observed by Kakani (2012) in cauliflower, Bhairwa (2017) in knol-khol and Maheshkumar and Rawat (2002) in cabbage. Whereas, the highest yield per plot (13.16 kg) and yield per hectare (34.81 ton) was recorded in 30×20 cm spacing. Similar

results were recorded by Mansa (2017) in red cabbage, Kakani (2012) in cauliflower, Sawale (2004) in cabbage and Maheshkumar and Rawat (2002) in cabbage. However, effect of spacing on days for initiation of knob was found non-significant.

Among nitrogen levels, the effect of nitrogen levels on vertical length of knob, average diameter of knob, yield per plot and yield per

hectare was found significant. The highest vertical length of knob (8.08 cm), average diameter of knob (5.70 cm), yield per plot (10.35 kg) and yield per hectare (27.38 ton) was recorded in 120 kg/ha nitrogen. Similar results were recorded by Kakani (2012) in cauliflower and Haqueet *al.*, (2015) in cabbage. However, effect of nitrogen levels on days for initiation of knob was found non-significant.

**Table.1** Effect of various spacing and nitrogen levels on growth and yield of knol-khol

Treatment	Plant Height (cm)	Number of leaves/plant	Plant spread (cm)	Leaf area (cm <sup>2</sup> )	Days for initiation of knob (days)	Vertical length of knob (cm)	Average diameter of knob (cm)	Yield per plot (kg)	Yield per ha (t)
<b>Effect of spacing</b>									
30x20 cm	36.14	15.30	47.18	851.58	22.04	6.83	4.67	13.16	34.81
30x30 cm	38.57	16.01	50.17	875.92	21.69	7.82	5.52	8.79	23.24
30x40 cm	41.18	16.66	52.54	855.86	21.34	8.66	6.17	6.85	18.12
Sem±	0.179	0.018	0.095	8.021	0.458	0.016	0.014	0.052	0.137
C.D. at 5%	0.536	0.053	0.284	N.S	N.S	0.048	0.042	0.156	0.411
<b>Effect of fertilizer levels</b>									
80 kg/ha	37.36	15.76	48.90	850.79	21.72	7.48	5.21	8.85	23.42
100 kg/ha	38.66	15.99	49.96	856.80	21.61	7.76	5.44	9.60	25.38
120 kg/ha	39.87	16.22	51.04	875.77	21.74	8.08	5.70	10.35	27.38
Sem±	0.179	0.018	0.095	8.021	0.458	0.016	0.014	0.052	0.137
C.D. at 5%	0.536	0.053	0.284	N.S	N.S	0.048	0.042	0.156	0.411

**Table.2** Effect of interaction of spacing and nitrogen levels on growth and yield of knol-khol

Treatment	Plant height (cm)	Number of leaves/plant	Plant spread (cm)	Leaf area (cm <sup>2</sup> )	Days for initiation of knob (days)	Vertical length of knob (cm)	Average diameter of knob (cm)	Yield per plot (kg)	Yield per hectare (t)
<b>Interaction effect</b>									
S <sub>30×20</sub> N <sub>80</sub>	34.97	15.00	45.79	847.13	22.90	6.50	4.40	12.23	32.36
S <sub>30×20</sub> N <sub>100</sub>	36.50	15.30	47.22	837.04	21.17	6.80	4.70	13.24	35.03
S <sub>30×20</sub> N <sub>120</sub>	36.94	15.60	48.52	870.56	22.07	7.20	4.90	14.01	37.05
S <sub>30×30</sub> N <sub>80</sub>	37.48	15.80	49.33	853.59	21.73	7.53	5.23	8.13	21.51
S <sub>30×30</sub> N <sub>100</sub>	38.83	16.00	50.30	876.96	21.53	7.87	5.53	8.88	23.48
S <sub>30×30</sub> N <sub>120</sub>	39.38	16.23	50.89	897.20	21.80	8.07	5.80	9.35	24.74
S <sub>30×40</sub> N <sub>80</sub>	39.63	16.47	51.57	851.65	20.53	8.40	6.00	6.19	16.38
S <sub>30×40</sub> N <sub>100</sub>	40.63	16.67	52.36	856.39	22.13	8.60	6.10	6.67	17.64
S <sub>30×40</sub> N <sub>120</sub>	43.29	16.83	53.70	859.56	21.37	8.97	6.40	7.69	20.34
Sem±	0.310	0.030	0.164	13.892	0.794	0.028	0.024	0.090	0.137
C.D. at 5%	0.929	0.091	0.493	N.S	N.S	0.083	0.073	0.269	0.731

The interaction effect of spacing and nitrogen level on vertical length of knob, average diameter of knob, yield per plot and yield per hectare was found significant. The highest vertical length of knob (8.97 cm) and average diameter of knob (6.40 cm) was recorded at spacing 30×40 cm and nitrogen level 120 kg/ha. Similar result reported by Haque *et al.*, (2015) in cabbage, Kakani (2012) in cauliflower and Maheshkumar and rawat (2002) in cabbage. Whereas, the highest yield per plot (14.01 kg) and yield per hectare (37.05 ton) was recorded at spacing 30×20 cm and nitrogen level 120 kg/ha. Similar result was observed by Mansa (2017) in red cabbage, Kakani (2012) in cauliflower and Haque *et al.*, (2015) in cabbage. Whereas, the interaction effect on days for initiation of knob was found non-significant.

The present investigation entitled "Study on spacing and nitrogen application on growth and yield of knol-khol (*Brassica oleracea* var. *gongylodes* L.)" has help to

conclude that for better growth, yield and yield contributing parameters knol-khol should be planted at closer spacing of 30×20 cm with application of FYM 15 t and 120 kg N, 50 kg P, 50 kg K per hectare. These findings are based on one season research trail, which needs to be confirmed for further two to three years before recommending the technology.

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