Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(4): 3476-3478
Received: 15-05-2020
Accepted: 18-06-2020

PR Hange
M.Sc Scholar, Department of Horticulture, VNMKV, Parbhani, Maharashtra, India

SR Barkule
Assistant Professor, College of Horticulture, VNMKV, Parbhani, Maharashtra, India

AS Lohakare
Assistant Professor, College of Horticulture, VNMKV, Parbhani, Maharashtra, India

Corresponding Author:
AS Lohakare
Assistant Professor, College of Horticulture, VNMKV, Parbhani, Maharashtra, India

Effect of different levels of chemical fertilizers and spacings on growth of knol khol (*Brassica oleracea Var. gongylodes* L.)

PR Hange, SR Barkule and AS Lohakare

Abstract
The experiment was laid in Factorial Randomized Block Design (FRBD) with two factors replicated thrice by using the variety White Vienna. The treatment comprises of first factor of fertilizers at three levels (F_1-75% of Recommended Dose of Fertilizer (RDF), F_2-125% of RDF and F_3-100% of RDF) and second spacing at four levels (S_1-30x15 cm, S_2-30x30 cm, S_3-45x30 cm and S_4-45x45 cm) with twelve treatment combinations. The effect of different levels of fertilizer on growth of knol-khol indicated that fertilizer level F_2 (125% of RDF) had maximum values for all growth parameters under study. While earliest 50% knob initiation (24.68 days) and days to knob harvest (54.76 days) was recorded in fertilizer level F_1 (75% of RDF). Regarding spacing S_4 (45x45 cm) showed significant results. The interaction effect of different levels of fertilizers and spacing showed the treatment combination F_2S_4 (125% of RDF + 45x45 cm) had best results.

Keywords: fertilizer, spacing, growth, knob

1. Introduction
Knolkhol (*Brassica oleracea var. gongylodes*) is a cool season crop belongs to the family cruciferae and is originated from the coastal countries of Mediterranean region. It is also known as kohlrabi, German turnip, cabbage turnip, Navalkol, Gunth Gobhi, and Ganth gobhi. 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. Knob is green or violet, and generally, round to flat round in shape. This knob is harvested for human consumption as raw or cooked vegetable for making salad and pickles, young leaves are also cooked as vegetable. The demand of Knol-khol also is increasing now a day due to its anti-hyperglycemia and anti-carcinogenic properties. Knol-khol is rich in carbohydrates and minerals. It also contains the antioxidant, vitamin A, C, E and carotene. It is good source of dietary fiber. It also contains sulphoraphanes and other isothiocyanates which are believed to stimulate the production of protective enzyme in the body. (Mishra *et al.* 2012) [6]. Knolkhol is mainly cultivated in Jammu and Kashmir, Himachal Pradesh, Assam, Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, West Bengal and Maharashtra.
Kolkhol is a heavy feeder and shows good response to fertilizer application (Shalini *et al.*, 2002) [8]. Adequate supply of nitrogen favors the transformation of carbohydrates into proteins and promotes the formation of protoplasm and since protoplasm is highly hydrated, the plant becomes more succulent. Phosphorus plays a vital role in several key physiological processes *viz.*, photosynthesis, respiration, energy storage and transfer, cell division and cell enlargement. It stimulates root growth, blooming, fruit setting and seed formation. Potassium is considered essential in photosynthesis, sugar translocation, nitrogen metabolism, enzyme activation, stomatal opening, water relation and growth of meristematic tissues. It acts as chemical traffic policeman, root booster, stalk strengthener, protein builder, and breathing regulator and retards the diseases. The optimum growth of knol-khol cannot be obtained only by application of proper nutrition but maintenance of optimum spacing between two plants and rows are also important (Ahmed *et al.*, 2003) [1]. Thus considering the need, present investigation was undertaken to find out the optimum dose of fertilizer and spacing for luxurious growth of knol khol.

2. Materials and methods
A field experiment entitled "Effect of different levels of chemical fertilizers and spacing on growth of Knol-khol (*Brassica oleracea Var. gongylodes* L*)"* was conducted at Horticulture Research Scheme (Vegetable) VNMKV, Parbhani during winter (*Rabi*) 2018-2019.

Regarding the observations for the growth parameters, five plants were selected randomly from each plot of two replications. Plants were selected from each plot and the growth observations were recorded as per procedure, plant height, number of leaves, leaf length, leaf width, fresh weight, dry weight of plant and their mean was calculated. Data obtained on various variables were analyzed by analysis of variance of factorial randomized block design as suggested by Panse and Sukhatme, (1987) [7].

3. Result and discussion

3.1. Plant height (cm)

Effect of fertilizer- A significant difference in plant height was observed at the time of harvesting. Fertilizer level F_2 recorded highest plant height (36.09 cm) which was significantly superior over rest of the treatments, whereas F_1 recorded lowest plant height (32.43 cm) at the time of harvesting.

Effect of Spacing- The data regarding effect of different levels of fertilizer and spacing on plant height at the time of harvesting is presented in Table 1. The highest plant height (38.56 cm) was found in S_4 (45x45 cm) which was significantly superior over rest of the treatment and lowest plant height (29.88 cm) was recorded in S_1 (30x15 cm).

Interaction effect of fertilizer and spacing on plant height- The combined effect of levels of fertilizer and spacing on plant height at the time of harvesting was non-significant. Maximum plant height (40.90 cm) was observed in F_2S_4. The interaction level F_1S_1 recorded minimum plant height (28.67 cm) at the time of harvesting. The above results indicated that increased levels of fertilizers i.e. F_2 (125% of RDF) recorded maximum height as compared to F_1 (75% of RDF) and F_3 (100% of RDF). These results were in conformity with the results obtained by Kakani (2012) [3] in cauliflower, Lavanya (2014) [4] in cabbage, Haque *et al*., (2015) [2] in cabbage and Mansa (2017) [6] in Red cabbage.

3.2. Number of leaves

Effect of fertilizer- The effect of different levels of fertilizers on number of leaves at the time of harvesting was found significant, Fertilizer level F_2 recorded highest number of leaves (15.38) which was at par with F_3 and lowest number of leaves (13.94) were recorded in F_1.

Effect of Spacing- The effect of different spacing on number of leaves at the time of harvesting was found to be significant. Highest number of leaves (16.01) recorded in S_4 (45x45 cm) which was at par with S_3 and lowest number of leaves (12.92) which was found in S_1

Interaction effect of fertilizer and spacing on number of leaves- Among different treatment combinations, the maximum number of leaves (17.20) at the time of harvesting was observed in F_2S_4 whereas the minimum (12.33) was seen in F_1S_1. However, the interaction effect was non-significant. These results indicate that the number of leaves per plant increases with the increase in spacing. Highest number of leaves per plant was found in S_4 (45×45cm).

3.3. Leaf length (cm)

Effect of fertilizer- The data presented in Table 1. Revealed that the effect of different levels of fertilizers on leaf length was found significant. The highest leaf length (30.36 cm) was recorded in fertilizer treatment F_2 which was statistically at par with F_3. Lowest leaf length (27.95 cm) was recorded in F_1.

Effect of Spacing- The data regarding effect of different spacing on leaf length at the time of harvesting is presented in Table 1. The highest leaf length (32.20 cm) was found at wider spacing in S_4 (45x45 cm) and it was found at par with spacing S_3 (45x30). Lowest leaf length (25.47 cm) was recorded in S_1 (30x15).

Interaction effect of fertilizer and spacing on leaf length- The combined effect of levels of fertilizer and spacing on leaf length at the time of harvesting was non-significant. The F_2S_4 showed maximum leaf length (34.27 cm) over rest of the treatments combination. The minimum leaf length (24.84 cm) recorded in F_1S_1 at the time of harvesting.

3.4. Leaf width (cm)

Effect of fertilizer- The effect of different levels of fertilizers on leaf width at harvesting was also found significant, the maximum leaf width (15.10 cm) recorded in F_2 which was statistically at par with F_3 i.e. (14.42 cm) and lowest leaf width (13.41 cm) was recorded in F_1.

Effect of Spacing- The maximum leaf width (16.23 cm) was found at wider spacing in S_4 which was significantly superior over rest of the treatment except with S_3 (15.30) and lowest leaf width (11.92 cm) was recorded in S_1.

Interaction effect of fertilizer and spacing on leaf width- The combined effect of levels of fertilizer and spacing on leaf width at harvesting was non-significant. Maximum leaf width (17.40 cm) was observed in F_2S_4. The minimum leaf width (11.33 cm) at harvesting recorded at F_1S_1. The leaf width of plant increases with the increase in spacing. Maximum leaf width of plant was found at wider spacing in S_4 (45×45 cm) that occurred due to availability of sufficient amount of light and nutrients to the plant.

3.5. Fresh weight per plant (g)

Effect of fertilizer- The result indicated significant effect of fertilizer levels on fresh weight of plant (g) at knob harvesting stage. Maximum fresh weight of plant (119.42 g) was recorded in fertilizer level F_2 and minimum fresh weight of plant (109.73 g) recorded in fertilizer level F_1.

Effect of Spacing- The effect of spacing on fresh weight of plant at the time of harvesting was found to be significant. Maximum fresh weight of plant (124.60 g) recorded in S_4 (45x45 cm) which was significantly superior over rest of the treatments and lowest fresh weight of plant (102.88g) was found in S_1 (30x15 cm).

Interaction effect of fertilizer and spacing on fresh weight per plant- The combined effect of levels of fertilizer and spacing on fresh weight of plant at harvesting was observed non-significant. Maximum fresh weight of plant (130.48 g) was observed in F_2S_4. The minimum fresh weight of plant (99.47 g) was recorded in F_1S_1.

3.6. Dry weight per plant (g)

Effect of fertilizer- The data regarding of fertilizer levels exerted significant effect on dry weight per plant. The maximum dry weight of plant (29.02 g) was recorded in fertilizer level F_2 at knob harvesting while minimum dry weight of plant (26.25 g) was found with fertilizer level F_1.

Effect of Spacing- The data presented in Table 6 revealed that the effect of different spacing on dry weight of plant was found significant, the maximum dry weight of plant (31.57 g) was recorded in spacing S_4 (45x45 cm) and lowest dry weight of plant (22.90 g) was recorded in S_1.

Interaction effect of fertilizer and spacing on dry weight per plant- Dry weight of plant varied non-significantly among treatment combination of fertilizer levels and spacing. However, the maximum dry weight of plant (33.13 g) was

recorded in F_2S_4 and the minimum dry weight of plant (22.13 g) recorded in F_1S_1.

Table 1: Effect of different levels of fertilizer and spacing on growth attributes of Knol-khol Cv. White Vienna.

Treatment	Plant height(cm)	No. of leaves	Leaf length(cm)	Leaf width(cm)	Fresh wt./plant(g)	Dry wt./plant(g)
Fertilizer (F)						
F_1	32.43	13.94	27.95	13.41	109.73	26.25
F_2	36.09	15.38	30.36	15.10	119.42	29.02
F_3	34.49	14.66	29.11	14.42	115.29	27.60
S.E m ±	0.33	0.33	0.58	0.36	1.21	0.37
CD at 5%	0.98	0.97	1.71	1.06	3.54	1.10
Spacing (S)						
S_1	29.88	12.92	25.47	11.92	102.88	22.90
S_2	31.43	14.24	27.83	13.57	111.65	26.55
S_3	37.16	15.47	31.12	15.30	119.17	29.52
S_4	38.56	16.01	32.20	16.23	124.60	31.57
S.E m ±	0.39	0.38	0.67	0.42	1.40	0.43
CD at 5%	1.13	1.12	1.97	1.23	4.09	1.27
Interaction (F X S)						
F_1S_1	28.67	12.33	24.84	11.33	99.47	22.13
F_1S_2	29.67	14.00	27.17	13.13	109.89	25.20
F_1S_3	35.17	14.60	29.67	14.10	113.42	27.67
F_1S_4	36.22	14.82	30.13	15.07	118.73	30.00
F_2S_1	31.10	13.50	26.10	12.50	106.29	23.67
F_2S_2	33.20	14.48	28.50	14.00	110.84	27.90
F_2S_3	39.16	16.33	32.57	16.50	127.50	31.37
F_2S_4	40.90	17.20	34.27	17.40	130.48	33.13
F_3S_1	30.13	13.35	25.73	12.23	104.37	24.10
F_3S_2	32.23	14.02	28.06	13.67	110.70	26.03
F_3S_3	37.32	15.17	30.33	15.50	120.31	29.33
F_3S_4	38.27	16.10	32.30	16.27	125.78	30.93
S.E m ±	0.67	0.66	1.16	0.73	2.42	0.75
CD at 5%	NS	NS	NS	NS	NS	NS

4. Reference

1. Ahmed Sher, Ahmed Fayaz, Faridullah Hussain, Munnir. Effect of different NPK levels on the growth and yield of kohlrabi (*Brassica caulorapa* L.) at Northern areas of Pakistan. Asian J Pl. Sci. 2003; 2(3):336-338.
2. Haque FA, Islam N, Islam MN, Ullah A, Sarkar D. Growth, yield and profitability of cabbage (*Brassica oleracea* L.) as influenced by applied nitrogen and plant spacing. The Agriculturist. 2015; 13(1):35-45.
3. Kakani I. Studies on the effect of plant densities and nitrogen levels on growth and curd yield of cauliflower (*Brassica oleracea* var. botrytis L.) cv. Pusa Sharad. M.Sc. (Horticulture) thesis, Dr. Y.S.R. Hort. Univ. Venkataramnnagudem, 2012, 136-147.
4. Lavanya. Effect of dates of planting and nitrogen on growth and yield of cabbage (*Brassica oleracea* var. capitata L.) M.Sc. Horticulture (Vegetable science) thesis, Dr. Y.S.R. Hort. Univ. Venkataramnnagudem, 2014, 151-162.
5. Mansa S. Effect of plant densities and nitrogen levels on growth and yield of Red cabbage M.Sc. Horticulture (Vegetable science) thesis, Dr. Y.S.R. Hort. Univ. Venkataramnnagudem, 2017, 154-167.
6. Mishra PP, Das AK, Battanayak SK, Ray M, Mishra N. Productivity, nutrient uptake and recovery by Knol-khol crop under the influence of INM practice in inceptisols of Bhubaneswr, Odisha. Int. J Tropical Agric. 2012; 33(4):1-4.
7. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. Fourth Edition. ICAR Publication, New Delhi, 1987, 187-196.
8. Shalini SB, Channal HT, Hebsur NS, Dharmati PR, Sarangamath PA. Effect of integrated nitrogen management on nutrient uptake in Knol-khol, yield and nutrient availability of soil. Karnataka J Agric. Sci. 2002; 15(1):43-46.