



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(8): 1632-1635
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www.thepharmajournal.com
Received: 08-06-2022
Accepted: 11-07-2022

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Performance of knol-khol under greenhouse and open field conditions

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Abstract

The research experiment was conducted in the Department of Horticulture, RSCM College of Agriculture, Kolhapur during *winter* 2018. Six promising varieties of Knol-khol *viz.*, KSP-5311, Giant, Early white Vienna, Videshi EWV, Neo and Local were evaluated in factorial randomized block design with three replications for the varietal performance under greenhouse condition and open field condition to explore the possibility of cultivation of Knol-khol in sub-mountain zone of Maharashtra. The results regarding days required for germination and percent germination was found non-significant as all the conditions had no variation for these characters. The earliest germination was found in greenhouse condition for the cultivar Giant (5.33 days) and late germination found in open field condition for Local cultivar (7.67 days). The earliest 50% germination (8.33 days) was found in *cv.* KSP-531 and Giant in greenhouse condition. The maximum percent of germination was noticed in Greenhouse for Giant (92%) and (83%) for Early white Vienna in open field condition. Maximum plant height 28.94 cm and 23.98cm was found for the cultivar Giant inside greenhouse and open field condition respectively. Minimum stalk length 22.03 cm and 26.89 cm was observed under open field condition and greenhouse condition respectively in the *cv.* Early white Vienna. Mean plant height in open field condition (23.15 cm) was lower than greenhouse condition (27.60 cm). Maximum number of leaves was observed in *cv.* Giant (11.67) followed by KSP-5311(10.67), Videshi EWV and local (10.33), Early white Vienna (10.00) and Neo (9.67) in greenhouse condition. Mean number of leaves inside greenhouse was 10.44 and that in open field were 9.00. The maximum leaf length was observed in both conditions in hybrid Giant for greenhouse was 29.33 cm and for Open field 24.67 cm. Mean leaf length inside greenhouse (27.39 cm) was higher than open field (24.00 cm) condition.

Keywords: Knol-khol, greenhouse, knob, germination

Introduction

Knol-khol (*Brassica oleracea var. gongylodes*) belongs to family Cruciferae is a winter season crop which is originated from the coastal countries of Mediterranean region (Choudhari *et al.*, 2017) [2]. It is also known as kohlrabi, German turnip, cabbage turnip, Navalkol, Gunth Gobhi, and Ganth gobhi. It has been under cultivation by Romans since 600 B.C. (Bose, 2001) [1]. In India, the cultivation of knol-khol is popular in Kashmir, Northern India, West Bengal and some parts of South India. It is a short duration crop, biennial showing seed maturity in the month of April-May. 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 sulforaphane and other isothiocyanates which are believed to stimulate the production of protective enzyme in the body (Mishra *et al.*, 2012) [5]. Knol-khol is utilized for making salad and pickles and occasionally younger leaves are cooked as vegetable.

Vegetable production needs proper strategies to ensure round the year availability to the increasing population at reasonable prices besides safeguarding the interest to the farmers. Cultivation of knol-khol under controlled environments or greenhouse is one of the most promising strategies. Cole crops in general are sensitive to weather conditions. Greenhouse provides an excellent facility for growth under controlled environment. Those people who are living in metropolitan cities can use their roofs and open floor for greenhouse cultivation for domestic consumption. Hence, keeping all the points in view, the present study "Performance of Knol-Khol under Greenhouse and Open Field Conditions" was undertaken to evaluate the performance of knol-khol.

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Materials and Methods

An experiment was conducted at the Instructional-cum-Research Farm of Horticulture Section, Rajarshi Chhatrapati Shahu Maharaj College of Agriculture, Kolhapur in winter season, 2018 under polyhouse and open field conditions. The Six different varieties of Knol-khol were procured from known sources of Maharashtra and TNAU, Coimbatore. The crop was grown inside a naturally ventilated polyhouse of size 27.40 m x 18.60 m (L x B) during the winter, 2018. Monthly variation in temperature and relative humidity inside the polyhouse was recorded during the entire period of investigation. Plain land adjacent to green house was utilized for evaluation of open field crop. The seeds of Knol-Khol were sown in plastic pro-trays by using soilless media having coco peat and vermicompost in the ratio of 2:1, respectively inside the naturally ventilated polyhouse on 31st December, 2018 to get healthy and disease-free seedlings of Knol-khol. The seedlings were ready for transplanting after 35 days and subsequently transplanted on 5th February, 2019 inside the naturally ventilated polyhouse as well as in open field as equipped with drip irrigation system. Other standard package of practices and plant protection measures were adopted from time to time to ensure good and healthy crop stand. The data generated through the present investigation was analysed as per the method given by Panse and Sukhatme (1985) [8].

Results and Discussion

Days required for germination, 50% germination and germination percentage

The result presented in Table 1 revealed that, there was arithmetic difference in the days required for germination, 50% germination and percent germination in greenhouse and open field conditions.

The result regarding germination was statistically non-significant. The numerical figures indicated that earliest germination was found in greenhouse condition for the cultivar Giant (5.33 days) and late germination found in open field condition for Local cultivar (7.67 days). The earliest 50% germination was found in KSP-531 and Giant (8.33) in greenhouse condition. While minimum 50% germination was found in open field. The maximum percent of germination was noticed in Greenhouse for Giant (92%) and in open field (83%) for Early white Vienna. The minimum Germination percentage was found in Open field (78%) for Local cultivar. The result obtained in the present investigation are found to be in close conformity with the studies of Dixit (2007) [3] he reported that the germination percentage was found 12-20% more under greenhouse condition as compared to open field. Similarly, Yungwei *et al.* (1995) [15] reported that germination percentage in cabbage was greatest in the greenhouse followed by the plastic house.

Table 1: Days required for germination, 50% germination and germination percentage due to different conditions in Knol-khol

Treatment details	Days required for initiation of germination			Days required for 50% germination			Germination percentage		
	C I	C II	Mean	C I	C II	Mean	C I	C II	Mean
KSP-531	6.00	7.33	6.67	8.33	10.00	9.17	90.67	80.67	85.67
Giant	5.33	6.67	6.00	8.33	10.00	9.17	92.67	82.00	87.33
Early White Vienna	5.67	6.33	6.00	9.00	10.33	9.67	89.00	83.00	86.00
Videshi EWV	5.67	7.33	6.50	8.67	9.67	9.17	91.00	81.67	86.33
Neo	5.67	7.33	6.50	8.67	10.33	9.50	86.67	78.33	82.50
Local	6.33	7.67	7.00	9.00	10.67	9.83	90.33	78.00	84.17
Mean	5.78	7.11		8.67	10.17		90.06	80.61	
S.E.±	0.221	0.128	0.312	0.244	0.141	0.345	2.54	1.47	3.60
CD at 5%	0.648	0.374	NS	NS	0.412	NS	NS	4.3	NS

Plant height (cm)

The data presented in Table 2 revealed that, there was non-significant effect of varieties on plant height. We found that the cultivar Giant had maximum plant height 28.94 cm and 23.98 cm inside greenhouse and open field condition respectively. Minimum stalk length 22.03 cm and 26.89 cm was observed under open field condition and greenhouse condition respectively in the cv. Early white Vienna. Mean plant height in open field condition (23.15 cm) was lower than greenhouse condition (27.60 cm). Our results are similar

with the findings of Suseela (2002) [14] he found that there was no significant variation in plant height and number of leaves among the various greenhouse which differ in their ridge heights. The plant height in the open field was significantly lower than all the greenhouse but not the number of leaves. Santosh *et al.* (2016) [10] and Panigrahi *et al.* (2010) [7], and Malshe *et al.* (2016) [4] also reported the better height and growth of the plant in protected condition as compared to open field and variation among the varieties in winter vegetables and capsicum respectively.

Table 2: Plant height (cm) as influenced by different varieties of Knol-khol under different conditions

Treatment details	Plant height (cm)		
	Green House (C-I)	Open Field (C-II)	Mean
KSP -5311	27.08	22.98	25.03
Giant	28.94	23.98	26.46
Early white Vienna	26.89	22.03	24.46
Videshi E W V	27.87	23.37	25.62
Neo	27.61	23.39	25.50
Local	27.22	23.15	25.18
Mean	27.60	23.15	
SE ±	0.91	0.52	1.28
CD at 5%	NS	1.54	NS

Number of leaves per plant

The data on Number of leaves per plant of the crop was influenced by growing conditions and is given in the Table 3. In greenhouse maximum number of leaves was observed in cv. Giant (11.67) followed by KSP-5311(10.67), Videshi EWV and local (10.33), Early white Vienna (10.00) and Neo (9.67). Under open field maximum number of leaves (9.33) found in cv. Giant, KSP-5311, Early white Vienna and Videshi EWV and minimum leaves were observed in cultivar local (8.67) and Neo (8.00). Mean number of leaves inside greenhouse was 10.44 and that in open field were 9.00 (Table 3).

Table 3: Number of leaves per plant of Knol-khol as influenced by different growing conditions

Treatment details	Number of leaves/plants		
	Green House (C-I)	Open Field (C-II)	Mean
KSP -5311	10.67	9.33	10.00
Giant	11.67	9.33	10.50
Early white Vienna	10.00	9.33	9.67
Videshi E W V	10.33	9.33	9.83
Neo	9.67	8.00	8.83
Local	10.33	8.67	9.50
Mean	10.44	9.00	
SE ±	0.255	0.147	0.361
CD at 5%	0.749	0.432	NS

Ramanarao *et al.* (2013) ^[9] reported that the number of leaves per plant as well as root zone length were higher for the capsicum crop cultivated in shade net over open field. Somashekhar (1980) ^[12] found that application of N at the rate of 225 kg per ha increased significantly number of leaves. Suseela (2002) ^[14] reported that there was no significant variation in number of leaves among the various greenhouse which differ in their ridge heights. Babychand *et al.* (2016) ^[16] noted that plants treated with 50 per cent RDF + VC @ 5 t ha⁻¹ (T3) registered maximum number of leaves per plant in knol-khol. The results of the present investigation are in conformity with the results of Panigrahi *et al.* (2010) ^[7] who reported that numbers of leaves are higher under protected conditions as compare to open field condition.

Leaf length (cm)

The results for leaf length (cm) are presented in Table 4. The maximum leaf length was observed in both conditions in hybrid Giant for greenhouse was 29.33 cm and for Open field 24.67 cm. In greenhouse minimum leaf length was found in KSP-5311 (27 cm) and for Open field it was found in Neo (23 cm). Mean leaf length inside greenhouse (27.39 cm) was higher than open field (24.00 cm) condition.

Table 4: Leaf length (cm) in Knol-khol as influenced by different growing conditions

Treatment details	Leaf length (cm)		
	Green House (C-I)	Open Field (C-II)	Mean
KSP -5311	27.00	24.33	25.67
Giant	29.33	24.67	27.00
Early white Vienna	27.67	24.00	25.83
Videshi E W V	27.33	24.00	25.67
Neo	26.33	23.00	24.67
Local	26.67	24.00	25.33
Mean	27.39	24.00	
SE +	1.074	0.62	1.51
CD at 5%	NS	1.81	NS

Our result is in conformity with the earlier findings of Babychand *et al.* (2016) ^[16] he registered maximum leaf length and leaf width in knol-khol treated with 50 per cent RDF + VC @ 5 t ha⁻¹. Silatar (2017) reported that highest plant spread East-West and North-South (36.89 cm and 36.48 cm, respectively) and leaf area (261.45 cm²) was observed with the plant spacing of 30 cm × 30 cm in Knol-khol.

Conclusions

The promising cultivars of Knol-khol *viz.* KSP-5311, Giant, Early white Vienna, Videshi EWV Neo and local were grown under greenhouse and open field condition for the varietal assessment. performance of Knol-khol under greenhouse condition was better as compared to open field condition. Greenhouse cultivation is most suitable technology for cultivation of Knol-khol for year round production to get maximum benefit. This technology generates more profit and suitable as compare to open field cultivation. By greenhouse cultivation farmers can cultivate high value vegetables particularly during lean period when open field cultivation is difficult. We can also cultivate off season vegetables and foreign vegetables by using greenhouse technology. It may be concluded that that greenhouse cultivation technology suitable for higher production and improve economic status of the farmers as compared to open field cultivation.

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