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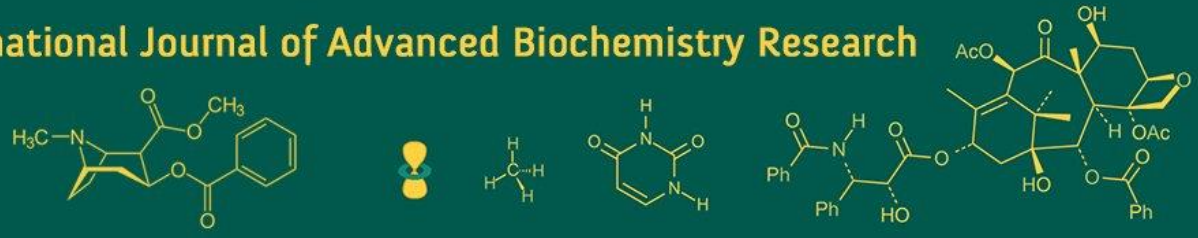

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Study on effect of date of transplanting and spacing on quality of knol-khol (*Brassica oleracea var. gongylodes* L.) cv. purple Vienna under Saurashtra region

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Abstract
Investigation was carried out on effect of date of transplanting and spacing on quality of knol-khol (*Brassica oleracea var. gongylodes* L.) cv. Purple Vienna under Saurashtra region. The treatment comprised four date of planting and four spacing. The highest ascorbic acid, chlorophyll content and organoleptic score were observed in 3rd week of November. Improved quality of knol khol knob in terms of TSS, ascorbic acid, chlorophyll content and organoleptic score were with spacing of 45 cm × 45 cm.

Keywords: Knol Khol, date of planting, spacing and quality

Introduction
India is rich in biodiversity of vegetables. Cole crop are the important cool season vegetable crops because of its nutritional value and wide spread production. However, there are many problems in its cultivation. Cole crops are known as the "Crown jewel of nutrition" for their rich vitamin, high fibre, low fat, and low-calorie properties. Knol-khol is the important fast growing and short duration crop. The cultivation of knol-khol was practiced in Northern Europe in 15th century. It has been under cultivation by Romans since 600 B.C. (Bose, 2001) [1]. It was introduced in India during 18th century and is now cultivated commonly during winter season in several parts of the country. Knol-khol, *Brassica oleracea* var. *gongylodes* L. is cole crop belongs to family Cruciferae. It is a diploid (*2n=2x*=18) and cross-pollinated crop. Its origin Northen Europe. It is known as Kholrabi (Combination of German word Cabbage + Turnip), German turnip, Navakhol, Gunth Gobhi or Ganth Gobhi. Edible part of knol-khol is knob (Swollen stem) and is formed from thickening of stem tissues just above the ground. Knob 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. Knol-khol is a stout, round tuberous vegetable. Purple Vienna of knol khol variety is about one week late than White Vienna (Early variety with globular, light green, smooth, tender, medium sized knob). Knob is purplish-blue with greenish-white flesh. It has purple leaves. It requires 55-65 days for knob formation with slightly better yield potential than White Vienna.

Materials and Methods
A field trial was conducted with a view to study the "Effect of date of transplanting and spacing on growth, yield and quality of knol-khol (*Brassica oleracea var. gongylodes* L.) cv. Purple Vienna under Saurashtra region" at the Instructional Farm, Jambuvadi, Department of vegetable science, College of Horticulture, Junagadh Agricultural University, Junagadh, Gujarat during *rabi* season of the year 2022-23 and 2024-25. The experiment was assigned with Randomized Block Design with factorial concept with 16 treatment combinations arising from four date of transplanting (D_1: 01st Week of November, D_2: 3rd Week of November, D_3: 01st Week of December and D_4: 3rd Week of December) and four spacing (S_1: 25 cm × 25 cm, S_2: 30 cm × 30 cm, S_3: 45 cm × 30 cm, S_4: 45 cm × 45 cm) with three replications.

Results and Discussion

Data on as TSS, Chlorophyll content, Ascorbic acid and Organoleptic score were statistically analysed and the means were presented in Table 01 along with interaction of date of planting and spacing.

TSS (º Brix)

Date of Transplanting

Table 1 revealed that the maximum TSS was observed in D_2: 3rd week of November (8.71 º Brix) in pooled data. There was no perceptible change in TSS of the knol khol knobs due to different times of planting evaluated during both the years. Kumar *et al.* (2007) [3] in broccoli also reported that the TSS was not influenced by planting date.

Spacing

Different spacing arrangements has significantly affected the TSS. The maximum TSS was observed with S_4: 45 cm × 45 cm (8.74 º Brix) pooled. The results of present investigation showed that increasing levels of spacing increase the quality content of TSS in knol-khol. These results are in close conformity with the findings of Kumar and Rawat (2002) [2].

Chlorophyll Content

Date of Transplanting

The maximum chlorophyll content was observed in D_2: 3rd week of November (0.82 mg g^{-1}) in pooled data.

Spacing

Different spacing arrangements has significantly affected the chlorophyll content. The maximum chlorophyll content was observed with S_4: 45 cm × 45 cm (0.87 mg g^{-1}) in pooled data. These quality attributes concentration significantly decreased with every delay in the planting date and they were affected by closer plant spacing and some condition effect might to be due to wider spacing plant get more better light, better availability of space, aeration and soil moisture as well as better nutrient for the growth" ((Suthar *et al.* (2017)) [5].

Interaction Effect

The interaction between different date of transplanting and spacing showed non-significant effect on TSS (º Brix) and chlorophyll contents in pooled data.

Table 1: Effect of date of transplanting and spacing on quality knol-khol

Treatments	TSS (º Brix)	Ascorbic acid (mg 100 g^{-1})	Chlorophyll content (mg g^{-1})	Organoleptic score
	Pooled			
Date of transplanting (D)				
D_1: 1st Week of November	8.03	36.08	0.77	6.87
D_2: 3rd Week of November	8.71	37.58	0.82	7.76
D_3: 1st Week of December	7.89	34.28	0.73	6.53
D_4: 3rd Week of December	7.72	34.06	0.61	6.30
S.Em.±	0.087	0.309	0.012	0.106
C.D. at 5%	0.24	0.87	0.03	0.30
Spacing (S)				
S_1: 25 cm × 25 cm	7.63	30.82	0.61	5.70
S_2: 30 cm × 30 cm	7.77	33.98	0.70	6.67
S_3: 45 cm × 30 cm	8.22	35.66	0.76	7.28
S_4: 45 cm × 45 cm	8.74	41.54	0.87	7.81
S.Em.±	0.087	0.309	0.012	0.106
C.D. at 5%	0.24	0.87	0.03	0.30
Interaction effect (D × S)				
S. Em.±	0.227	1.496	0.032	0.301
C.D. at 5%	NS	0.87	NS	0.30
C.V.%	5.28	4.24	8.43	7.61

Ascorbic Acid

Date of Transplanting

The results indicate that the date of transplanting had significant influence on the ascorbic acid. The maximum ascorbic acid was observed in D_2: 3rd week of November (37.58 mg 100 g^{-1}) in pooled data. The ascorbic acid content increased with delayed planting probably because the lower temperature favors its formation. (Singhal *et al.* 2009) [4]

Spacing

Different spacing arrangements has significantly affected the ascorbic. The maximum ascorbic acid was observed with S_4: 45 cm × 45 cm (41.54 mg 100 g^{-1}) in polled result.

Organoleptic Score

Date of Transplanting

The results indicate that the date of transplanting had significant influence on the organoleptic score. The maximum organoleptic score was observed in D_2: 3rd week of November (7.76) in pooled data.

Spacing

The maximum organoleptic score was observed with S_4: 45 cm × 45 cm (7.81) in polled data.

Interaction Effect

Interaction effect between date of transplanting and spacing on ascorbic acid and organoleptic score of knol khol were found significant.

Conclusion

The best performance of knol khol with the highest quality could be realized with planting during 3rd week of November at a wider spacing of 45 cm × 45 cm in the present domain study. The above said package of agro-techniques was found to be the most efficient for enhancing the quality of knol khol in the Saurashtra region.

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