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Effect of growth and physiological aspects of knol khol (*Brassica oleracea var. gongylodes* L.) cv. early white

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Abstract

To investigate the impact of growth and physiological aspects of Knol khok (*Brassica oleracea var. gongylodes*) cv. Early white, an experiment using a randomized block design was carried out in 2022 at the Horticulture orchard, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Chidambaram, Tamil Nadu. In this study, the Knol khol crop were grown in *late Rabi* season which had a fluctuations in temperature getting raised. Different plants were selected from plot to study the varies growth and physiological traits of knol khol. The results reported that the growth parameters like plant height (cm) at 25 and 45 DAT, leaf length (cm), leaf width (cm), leaf area (cm²), fresh weight (g), dry weight (g) shown the variation except in no. of leaves and physiological parameters like leaf area index at 25 and 45 DAT, leaf area ratio (cm² g⁻¹), leaf area duration, specific leaf area (cm² g⁻¹), specific leaf weight (mg cm²), and leaf weight ratio (gg⁻¹) observed the variations between the plants in these parameters except absolute growth rate (cm day⁻¹). Despite being a cool season crop, knob formation is halted and increased the vegetative growth as a result of ring temperature.

Keywords: Knol khol, temperature, physiology

Introduction

Knolkhol (*Brassica oleracea var. gongylodes* L.) is a cool season vegetable crop under cole group and belongs to family Brassicaceae which is native to Mediterranean regions. Gradually demand has increasing in Eastern part of India due to its antihyper glycaemia and anticarcinogenic properties. It is a good source of dietary fibre and rich in vitamins C, E and Carotene and antioxidants. It contains sulphoraphanes and isothiocyanates, which are believed to stimulate the production of protective enzymes in the body (Panda *et al.*, 2019) ^[1]. Knol khol has a bulb like swollen edible portion is stem known as knob, which is arises from thick stem tissues above the cotyledon. Leaves are attached on bulb like swollen structure. Knob is green or violet, and generally, round to flat round in shape (Hange *et al.*, (2020) ^[6]. Knol khol is a winter vegetable crop, cultivated in cool and moist climatic condition. Seeds are germinated at temperature of 15 to 30 °C (Meena *et al.*, 2021) ^[8]. Temperature is the primary effect of climate change that undesirably affects the vegetable production. High temperature causes a significant alteration in morphological, physiological, biochemical and molecular response of the plant and affects the growth and development of plant (Abewoy, 2017) ^[1]. Though it is a cool season vegetable, tolerant to low temperature and sometimes even frost (Akhtar *et al.*, 2021) ^[2]. Unpredictable high temperature spells with consequently reduce crop productivity (Bhardwaj *et al.*, 2016) ^[3]. Plants needed food for their growth and development in the form of proper doses of NPK fertilizers. Nitrogen is a part of chlorophyll molecule, amino acid, proteins, nucleic acid and pigments (Cavazza and Bianco, 2005) ^[4]. Phosphorus plays a vital role in several key physiological processes, *viz.* photosynthesis, respiration, energy storage and transfer, cell division and enlargement. It stimulates root growth, blooming, fruit setting and seed formation (Memon, 1996) ^[9]. It is mainly cultivated in Maharashtra, Madhya Pradesh, Himachal Pradesh, Punjab, Haryana, West Bengal and Jammu and Kashmir. Besides it is also cultivated in some parts of southern states (Nagar G 2019) ^[10].

Material and Methods

The present investigation was carried out in Horticulture orchard, Faculty of Agriculture, Annamalai University, Chidambaram during 2022 with Knol khol cv. Early white. The experiment was laid out in randomized block design. Seeds were sown in 29th January, 2022. Different plants were selected from plot to study the varies growth and physiological traits of

knol khol. Observations were recorded on seven randomly selected plants with fourteen parameters *viz.*, Growth parameters like Plant height (cm) at 25 and 45 DAT, Leaf length (cm), leaf width (cm), No. of leaves, Leaf area (cm²), Fresh weight (g), Dry weight (g) and Physiological parameters like Leaf area index at 25 and 45 DAT, Leaf area ratio (cm² g⁻¹), Leaf area duration, Specific leaf area (cm² g⁻¹), Specific leaf weight (mg cm⁻²), Leaf weight ratio (gg⁻¹), Absolute growth rate (cm day⁻¹).

Results and Discussion

Growth parameters of knol khol

The results of present studies (Table 1) revealed that the growth parameters of knol khol like plant height at 25 and 45 DAT, leaf length (cm), leaf width (cm), no. of leaves, leaf area (cm²), fresh weight (g) and dry weight (g). The maximum plant height at 25 DAT and 45 DAT (40.20 cm and 50.60 cm) significant at P5 and P3, leaf length (20.80 cm),

leaf length (15.67 cm) and no. of leaves (11.67 cm) which is significant at P2, leaf area (164.50 cm²), fresh weight (215.80 g) and dry weight (40.05 g) (Fig. 1) which was significantly superior at P3 than all other plants. Though knol khol is a cool season crop, increasing temperature leads to increase the vegetative development and stops the growth of knob formation. So it shows the impact in production of knol khol crop. In understanding extreme events and their impact on plants, have to consider the plant temperature response relative to the meteorological temperature. Temperature which would be considered extreme and fall below or above specific thresholds at critical times during development can significantly impact productivity. In general, extreme high temperature during the reproductive stage will affect knob formation in knol khol (Hatfield *et al.*, 2011)^[7]. The data on Table 1 shows that the height of the plant was not influenced by the high.

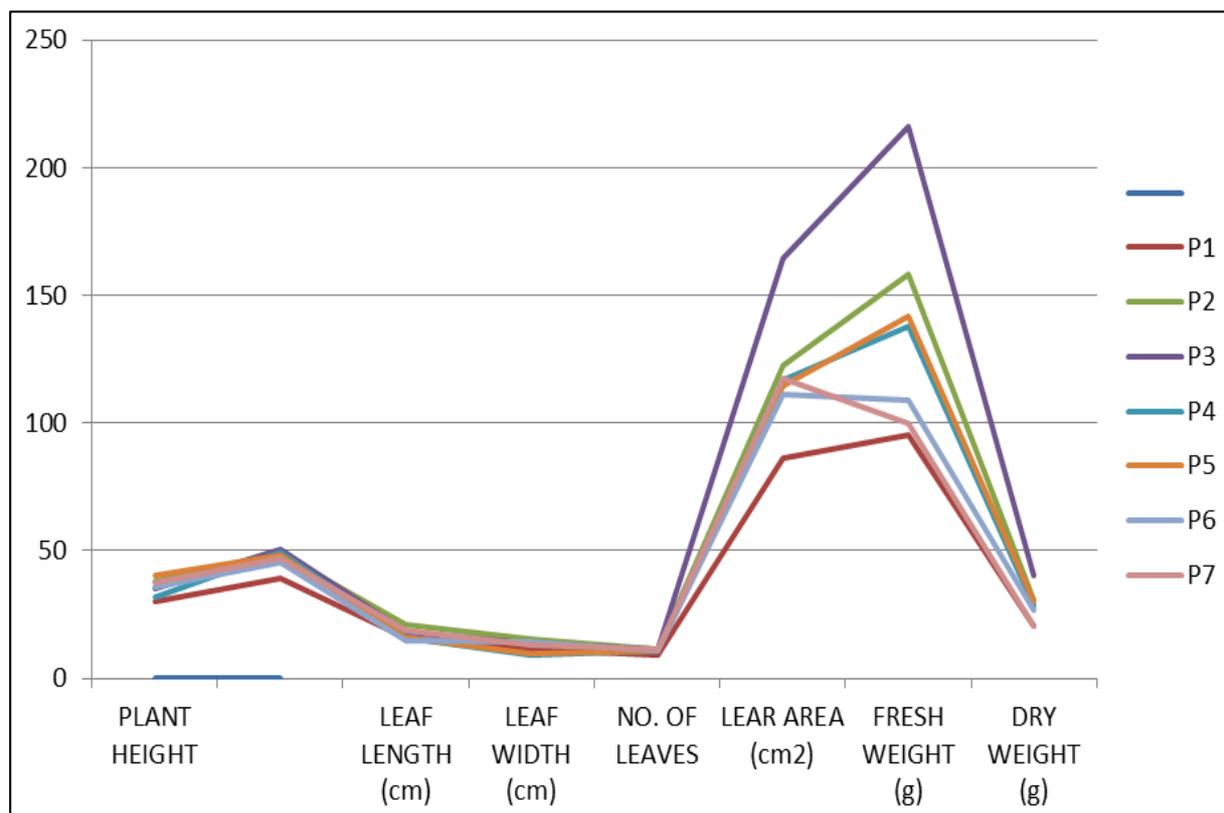


Fig 1: Graphical representation of Growth parameters of knol khol like plant height (cm) at 25 and 45 DAT, leaf length (cm), leaf width (cm), no. of leaves, leaf area (cm²), fresh weight (g) and dry weight (g).

Physiological parameters of knol khol

The data regarding the physiological parameters as affected by high temperature have been presented in Table 2. However, after complete analysis of the physiological parameters, it can be concluded that the knol khol has recorded highest in plant P2 of leaf area index at 25 DAT and

45 DAT (0.0257 and 0.0637), leaf area ratio (5.917), leaf area duration (0.950), specific leaf weight (0.0135), leaf weight (0.057). The other parameters like specific leaf area (102.13) and absolute growth rate (Fig. 2) (0.816) has recorded highest in P4.

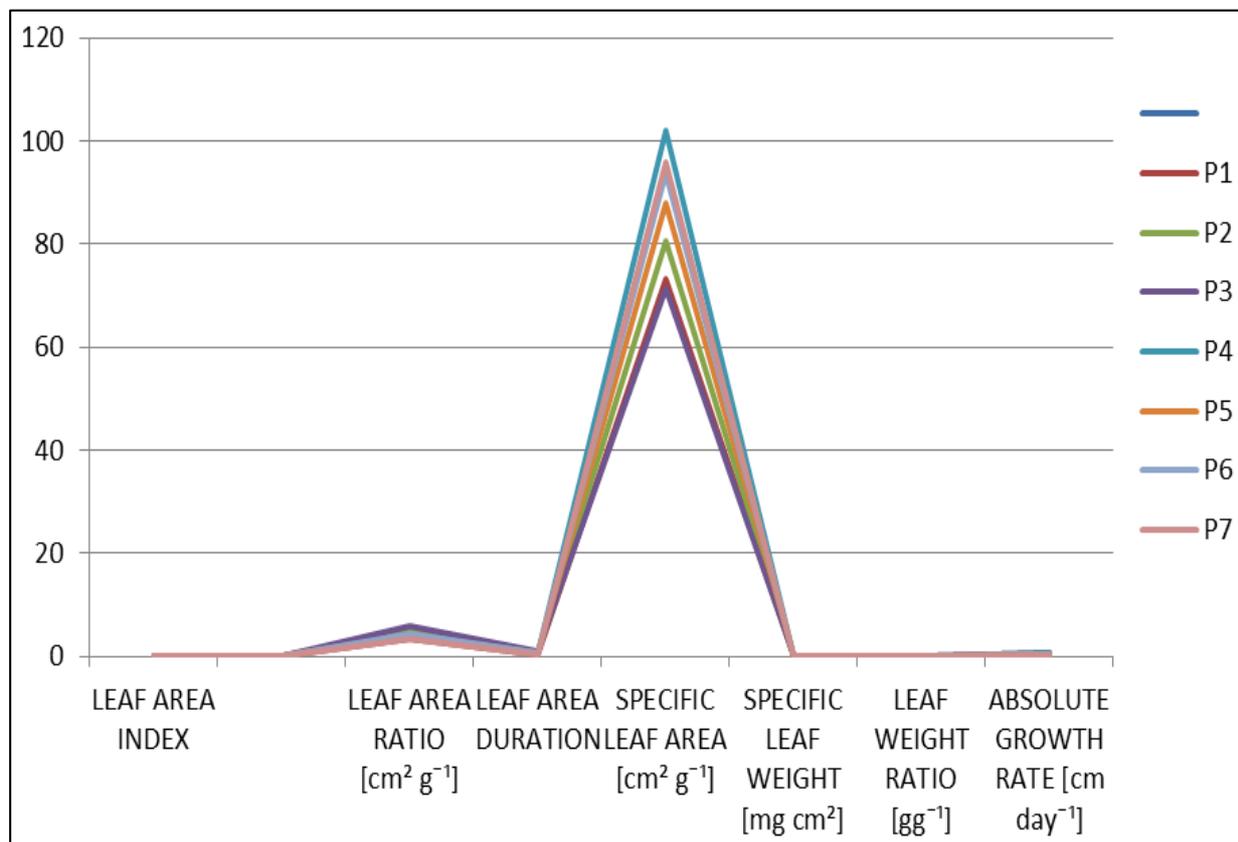


Fig 2: Graphical representation of Physiological parameters of knol khol like leaf area index, leaf area ratio, leaf area duration, specific leaf area, specific leaf weight, leaf weight ratio and absolute growth rate.

Table 1: Growth parameters of Knol-khol

Plants	Plant height (cm)		Leaf length (cm)	Leaf width (cm)	No. of leaves	Leaf area (cm ²)	Fresh weight (g)	Dry weight (g)
	25 DAT	45 DAT						
P ₁	30.00	38.97	16.00	11.37	9.00	86.40	95.40	20.68
P ₂	38.00	48.87	20.80	15.67	11.67	122.37	158.07	30.76
P ₃	35.00	50.60	18.33	13.80	11.67	164.50	215.80	40.05
P ₄	32.00	49.30	15.87	9.23	11.00	116.90	137.87	28.37
P ₅	40.20	48.50	15.87	9.67	11.00	114.60	141.53	30.27
P ₆	36.00	45.57	14.57	14.17	10.67	110.93	108.93	26.70
P ₇	37.67	46.87	18.63	13.13	11.67	117.20	99.97	20.53
SEM	0.597	0.426	0.413	0.202	1.598	2.491	0.376	0.222
CD AT 5 %	1.762	1.279	1.240	0.608	4.792	7.468	1.129	0.665
CV %	0.409	0.224	0.596	0.403	3.611	0.518	0.068	0.194

Table 2: Physiological parameters of Knol-khol

Plants	Leaf area index		Leaf Area Ratio [cm ² g ⁻¹]	Leaf area duration	Specific leaf area [cm ² g ⁻¹]	Specific leaf Weight [mg cm ²]	Leaf weight ratio [gg ⁻¹]	Absolute growth Rate [cm day ⁻¹]
	25 DAT	45 DAT						
P ₁	0.0143	0.0307	3.417	0.403	73.25	0.0127	0.052	0.314
P ₂	0.0217	0.0447	4.860	0.644	80.51	0.0119	0.046	0.512
P ₃	0.0257	0.0637	5.917	0.950	71.31	0.0135	0.057	0.735
P ₄	0.0213	0.0427	4.100	0.676	102.13	0.0093	0.037	0.816
P ₅	0.0173	0.0423	4.130	0.623	87.93	0.0109	0.041	0.371
P ₆	0.0160	0.0397	4.283	0.594	93.84	0.0102	0.042	0.444
P ₇	0.0140	0.0417	3.520	0.505	95.96	0.0100	0.056	0.420
SEM	0.00031	0.00033	0.0492	0.0068	0.297	0.00010	0.00053	0.0384
CD AT 5 %	0.00094	0.00100	0.1475	0.0205	0.891	0.00031	0.00160	0.1152
CV %	0.41578	0.18909	0.28196	0.26933	0.0851	0.22923	0.27911	1.84303

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