Plant Archives Vol. 26, Supplement 1, 2026 pp. 19-23 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.004

ADAPTABILITY OF CHINESE CABBAGE HYBRIDS UNDER VARIED GROWING CONDITIONS

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(Date of Receiving : 12-08-2025; Date of Acceptance : 13-10-2025)

ABSTRACT

An experiment entitled "Adaptability of Chinese Cabbage Hybrids under Varied Growing Conditions" was conducted in five different growing conditions viz., 3 different shade nets (35 %, 50 % and 75 %) shade intensity, polyhouse and open condition. Two hybrid varieties viz., Sun-60 & Tropical Highland were used for the experimental research in *Rabi* 2020-21. The experiment was laid out in split plot design with ten treatment combinations and four replications. The results indicated that among the different growing conditions, Minimum number of days required for head initiation (28.42 days) and for harvest (58.95 days) were recorded in polyhouse. While open condition required maximum days for head initiation and days for harvest (38.87 and 79.47 days) respectively. Similarly, V_1 (Sun-60) recorded minimum days for head initiation and harvest (33.68 and 67.70 days) respectively. When it comes to yield and yield attributing parameters, the same treatment, polyhouse condition (G_4) recorded significantly maximum values in parameters such as head length (29.01 cm), head width (12.11 cm), head weight (694.33 g), size of head (351.28 cm²), yield per plot (10.79 kg) and yield per hectare (501.05 q) on comparing with other growing conditions. Likewise, hybrid variety V_2 (Tropical Highland) recorded significantly maximum values in parameters such as head length (26.85 cm), head width (11.45 cm), head weight (564.72 g), size of head (305.55 cm²), yield per plot (8.81 kg) and yield per hectare (408.63 q).

Keywords **:** Chinese cabbage, Polyhouse, Shadenet, Growing conditions.

Introduction

India is endowed with a wide diversity of tropical, sub-tropical, and temperate vegetables. However, some crops still remain rare or unfamiliar to the majority of farmers and consumers. Farmers can significantly increase their income by cultivating such rare, high-value cole crops, especially in peri-urban areas near cities, where they command premium prices in cosmopolitan markets, five-star hotels, and tourist destinations (Thapa and Rai, 2012).

Chinese cabbage (*Brassica rapa* var. *pekinensis*), commonly known as Napa cabbage, is one such crop. The term "Chinese cabbage" broadly refers to a group of Brassica crops, which may be loose-leaved (with or without flowers) or form a dense head (Pandey *et al*., 2020). Although the crop is naturally biennial, it is generally cultivated as an annual, requiring 55 to 100 days from sowing to maturity depending on the cultivar.

The cylindrical head of Chinese cabbage is firm, though less compact than that of common cabbage. The outer and wrapped leaves are pale green, while the inner leaves are blanched to a creamy white. Leafy types have thick, white petioles with smooth, glossy, dark-green, rounded blades. Flowering Chinese cabbage produces small flowers on erect stalks, ranging in colour from yellow to purple depending on

the variety. Harvesting of leafy flowering types is generally done in 40–45 days, when two to three flowers have opened (Rana, 2008).

Nutritionally, Chinese cabbage is rich in carotene, vitamins B_1 and B_2, and contains higher vitamin C than lettuce. Citric acid is its dominant organic acid. The total glucosinolate content varies by type: heading forms range from 0.097 to 0.337 g/kg fresh weight (average 0.198), while leafy types range from 0.390 to 0.704 g/kg (average 0.534 g/kg) (Lewis and Fenwick, 1988).

Cultivation of horticultural crops under controlled environments, particularly in greenhouses, offers a promising strategy for producing high-value vegetables. Cole crops are sensitive to weather fluctuations, and greenhouses provide protection and regulated conditions that ensure better growth. Urban residents with access to rooftops or open spaces can adopt greenhouse cultivation for both household use and commercial purposes.

Temperature is a key factor influencing cole crop growth under different agro-climatic conditions. A greenhouse, typically covered with plastic film, allows solar radiation to enter while trapping thermal radiation emitted by plants, creating a warmer environment. The CO_2 released by plants at night is also retained, enhancing the rate of photosynthesis during the day. Additionally, water vapor from plant transpiration and soil evaporation increases humidity inside, which further supports crop growth (Sirohi and Behara, 2000).

Keeping above points in view, the present investigation on "Adaptability of Chinese Cabbage Hybrids under Varied Growing Conditions" was undertaken at the department of Horticulture, Rajarshee Chhatrapati Sahu Maharaj College of Agriculture, Kolhapur with objectives to evaluate the Chinese cabbage hybrids for yield and yield attributing characteristics and to evaluate the pest incidence under various growing conditions.

Materials and Methods

The experiment was conducted during the winter, 2020-21 at the Instructional-cum-Research Farm of Horticulture Section, Rajarshee Chhatrapati Sahu Maharaj College of Agriculture, Kolhapur, which is situated at 16° 41' North latitude and 74°16' East longitude. The altitude of Kolhapur is 548 meter above mean sea level. Agro-ecologically this area comes under sub-mountain zone of Maharashtra state with annual rainfall range of 1000 to 2500 mm with an average rainfall of 1057 mm. The experiment was laid out in Split plot design having five growing conditions (viz, three shade net houses 35, 50 and 75 per cent shading intensities, Polyhouse and open condition) with two hybrid varieties (Sun-60 and Tropical Highland respectively) replicated four times. The transplanting of seedlings was accomplished with the spacing of (45 cm x 30 cm) having plot area (2.4 m × 1 m) in every growing conditions. The recommended dose of fertilizer @ 120:80:80 N, P_2O_5 and K_2O kg ha^{-1} was applied during growing season through drip system. Urea, Phosphoric acid and white potash were used as source of N, P_2O_5 and K_2O respectively. Regular cultural as well as crop protection measures were adopted as per the requirements of crops in every growing condition. The yield and yield attributing parameters like days required for head initiation, days required for harvest, head length (cm), head width (cm), head weight (g), size of head (cm^2), yield per plot (kg) and yield per hectare (q) were recorded. The average of five plants was computed to get the mean value. The data recorded were analyzed statistically using technique of analysis of variance and significance was determined by Split plot design (Panse and Sukhatme, 1985). The standard error of mean (S.Em.±) was calculated. Whenever, the results were significant, the critical difference (CD) at 5 % level of significance was worked out and presented.

Results and Discussion

Data presented in table 1 confirms that different growing conditions and hybrid varieties had significantly positive influence on days required for head initiation and harvest of Chinese cabbage. Days required for head initiation and Days required for harvest of Chinese cabbage were significantly influenced by different growing conditions and hybrid varieties. Minimum number of days required for harvesting (58.95 days) and head initiation (28.42 days) respectively was recorded in G_4 (Polyhouse), while G_5 (open condition) took maximum days (79.47 days and 38.87 days) respectively. Similarly, among hybrid varieties, minimum number of days (67.70) required for harvesting and head initiation (33.68 days) was recorded in V_1 (Sun-60) whereas variety V_2 (Tropical Highland) took 70.51 days and 35.05 days respectively. Less days required in polyhouse might be due to optimum and congenial micro-climate that prevailed inside the greenhouse which results in rapid vegetative growth. These findings are in accordance with Nagalakshmi *et al.* (2001), Minz (2004) and Thapa *et al.* (2013) in broccoli.

The length of head was influenced significantly due to different growing conditions. Significantly highest head length (29.01 cm) was recorded in

growing condition G_4 (Polyhouse) which was statistically at par with G_2 (50 % shade intensity) i.e. 27.16 cm. Likewise, head length was differed significantly among two different hybrid varieties. Highest head length (26.85 cm) was found in V_2 (Tropical Highland) whereas it was 25.73 cm in V_1 (Sun-60). The width of head was also influenced significantly due to different growing conditions. Highest head width (12.11 cm) was recorded in growing condition G_4 (Polyhouse) which was statistically at par with G_2 (50 % shade intensity) (11.40 cm) and G_1 (35 % shade intensity) (11.35 cm). Likewise, highest head width (11.45 cm) was found in V_2 (Tropical Highland) whereas it was 10.93 cm of V_1 (Sun-60). Head length and head width might be more in polyhouse due to ideal climatic condition inside the polyhouse which might have enhanced faster cell division and cell elongation, which eventually led to more vegetative growth. These findings are in agreement with Babu and reddy (2017), Laczi *et al.* (2016) in Chinese cabbage and Thapa *et al.* (2013) in Broccoli also reported more head width under polyhouse condition whereas, Yasoda *et al.* (2018) in Cauliflower.

Significantly highest weight of head (694.33 g), size of head (351.28 cm^2), yield per plot (10.79 kg) and yield per hectare (501.05 q) were recorded in growing condition G_4 (Polyhouse) (Table-1). These parameters were also influenced significantly due to different hybrid varieties. Significantly highest weight of head (564.72 g), size of head (305.55 cm^2), yield per plot (8.81 kg) and yield per hectare (408.63 q) was recorded in V_2 (Tropical Highland). The highest head weight, head size, yield per plot and yield per hectare in polyhouse might be due to the highest head length and width of the respective varieties and increased yield under polyhouse condition was due to favourable climatic conditions, which led to higher vegetative growth which might have resulted to early head initiation, increased accumulation of food material and thereby increased yield. Similar results were also reported by Laczi *et al.* (2016) in Chinese cabbage, Minz (2004), Thapa *et al.* (2013), Ngullie and Biswas (2016) in capsicum, Rane (2020), Ashok and Ravivarman (2021) in coriander and Yasoda *et al.* (2018) in cauliflower.

G_1- 35 % Shade net, G_2- 50 % Shade net, G_3:- 75 % Shade net, G_4:- Polyhouse, G_5:- Open condition, V_1:- Sun-60, V_2:- Tropical Highland

Fig. 1: Chinese cabbage heads as influenced by different growing conditions and hybrid varieties

Table 1: Influence of different growing conditions and varieties of Chinese cabbage on yield and yield attributing parameters.

Growing condition (G)	Days required for head initiation	Days required for harvest	Length of head (cm)	Width of head (cm)	Weight of head (g)	Size of head (cm^2)	Yield per plot (kg)	Yield per hectare (q)
G_1	34.94	68.07	25.53	11.35	524.39	290.70	8.25	381.88
G_2	33.60	67.47	27.16	11.40	571.95	308.10	8.84	409.02
G_3	36.00	71.56	26.07	10.70	491.71	272.98	7.71	356.88
G_4	28.42	58.95	29.01	12.11	694.33	351.28	10.79	501.05
G_5	38.87	79.47	23.68	10.42	456.31	247.87	7.13	330.20
S.E.±	0.82	1.49	0.62	0.26	26.98	10.78	0.41	19.11
CD @ 5%	0.52	4.59	1.91	0.80	83.15	33.22	1.25	58.88
Hybrid								
V_1	33.68	67.70	25.73	10.93	530.76	282.82	8.27	382.98
V_2	35.05	70.51	26.85	11.45	564.72	305.55	8.81	408.63
S.E.±	0.45	0.93	0.36	0.16	8.31	5.35	0.12	5.54
CD @ 5%	1.37	2.81	1.08	0.48	25.05	16.13	0.36	16.71
Interaction (G x V)								
S.E.±	1.01	2.08	0.8	0.36	18.58	11.97	0.27	12.40
CD @ 5%	NS	NS	NS	NS	NS	NS	NS	NS

Conclusion

The Polyhouse condition (G_4) was significantly ideal for all yields attributes viz. days required for head initiation (28.42 days), days required for harvest (58.95 days), length of head (29.01 cm), width of head (12.11 cm), average weight of head (694.33 g), size of head (351.28 cm^2), yield per plot (10.79 kg) and yield per hectare (501.05 q) of Chinese cabbage when compared to other growing conditions. Similarly, among hybrids V_2 (Tropical Highland) shown ideal results for majority of the yield attributes when compared to V_1 (Sun-60).

Based on the experimental results, it can be concluded that growing of Chinese cabbage under Polyhouse condition (G_4) and hybrid variety Tropical Highland was found most suitable for achieving higher yield during Rabi season.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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