



**Research Note :**

**PERFORMANCE OF CABBAGE HYBRIDS UNDER RAINFED MID-HILL CONDITIONS OF UTTARAKHAND**

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**ABSTRACT:** The pooled data indicated considerable variation for vegetative characters, amongst which the maximum leaf area (1022.71 cm<sup>2</sup>) was observed in Varun, while the hybrid T-50 top ranked with respect to number of wrapper leaves (14.98) and plant spread (68.56 cm). Golden Acre, an open pollinated check variety, took minimum number of days to maturity (44 days from transplanting). Best quality and yield parameters viz., the maximum ascorbic acid content (139.53 mg/100 g) and head size (515.05 cm<sup>2</sup>) were recorded in Blue Diamond and NBH-Arun, respectively, whereas, T-50 measured the maximum head weight (2.106 Kg) and yield (801.19 q/ha).

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**Keywords:** Performance, cabbage, hybrids, net profit.

Among the Cole crops, cabbage (*Brassica oleracea var. capitata* L.,  $2n = 2x = 18$ ) is grown in more than ninety countries throughout the world and consumed globally (Singh *et al.*, 8). It is a rich source of protein comprising all essential amino acids, especially sulphur containing amino acids, minerals such as calcium, iron, magnesium, sodium, potassium, phosphorus and antioxidants, which are reported to have anti-carcinogenic properties (Singh *et al.*, 9). Although, in developed countries more than 90 per cent cabbage area is under hybrids, while in India hybrids are confined to only 30 per cent of cabbage grown area. In Uttarakhand mid-hills, it is grown from April to November during the time its production is not possible under the agro-climatic condition of plains, as a result the cabbage growers in hilly areas fetch premium prices and immense potential in maximizing the profit and improving the socio-economic status of vegetable growers.

The cabbage cultivars show great variation in respect of shape, size and colour of the leaves as well as texture of head and behave differently under different agro-climatic region. The hill farmers are growing the varieties / hybrids recommended for the irrigated condition of northern plains and these

perform poorly during the summer-rainy season (off-season) under the different altitudic zone of hills. Therefore, in order to maximize cabbage yield in this region it has become imperative to select the suitable varieties and workout cultural practices. Therefore, it is the needed to evaluate the yield performance of some of the varieties of cabbage especially hybrids, under the agro-climatic condition of Uttarakhand to find out the best variety / hybrid for commercial cultivation at farmers field in order to maximize the profit.

The experiment was under taken for two consecutive years 2009 and 2010 to evaluate performance of ten cabbage hybrids/varieties under rainfed mid hill conditions of Uttarakhand. The site of experimentation was Research farm of Department of Vegetable Science. G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Uttarakhand.

The experimental materials comprised of 9 cabbage hybrids viz., FM-Super, Suttind Manas, T-50, T-621, Green Hero, Varun, NBH-Arun, Indica, and Blue Diamond were procured from different leading seed companies tested with the available popular variety of the region *i.e.* Golden Acre in a Randomized Complete Block Design replicated thrice. About one month old seedlings

were transplanted on 8<sup>th</sup> July 2009 and 3<sup>rd</sup> July 2010 (1<sup>st</sup> and 2<sup>nd</sup> year, respectively) in a plot size of 3 x 2 m<sup>2</sup> at a spacing of 50×50 cm. During transplanting FYM and N: P<sub>2</sub>O<sub>5</sub>: K<sub>2</sub>O @ 20 t/ha and 120:75: 60 kg/ha, respectively, were applied uniformly during both years. Data were recorded for leaf area (cm<sup>2</sup>), number of non-wrapper leaves, plant spread (cm), head size (cm<sup>2</sup>), net head weight (Kg), plant mortality (%), days to marketable maturity, head compactness (g/cm<sup>3</sup>), ascorbic acid content (mg/100 g) and yield of marketable head (q/ha) and average data were analysed statistically.

The data (Table 1) revealed that the cabbage hybrids selected for the study in both years differed significantly with each other for the traits under investigation.

#### (a)Vegetative characters

It is evident from the results that among 9 hybrids and 1 open pollinated variety selected for the experiment, significant differences were observed for leaf area, number of non-wrapper leaves, plant spread, plant mortality and days to marketable maturity. The of leaf area ranged from 439.96 cm<sup>2</sup> (Suttind Manas) to 1022.71 cm<sup>2</sup> (Varun). With respect to number of non wrapper leaves it was in between 11.75 (T-621) to 14.98

(T-50). Similar observation was also observed by Boswell and Pearson (2) who reported high variability amongst varieties with respect to non wrapper leaves. Similarly, the cultivars also differed significantly for plant spread with a maximum value of 68.56 cm in T-50 and minimum value of 55.73 cm in Golden Acre plants. In general, the plant having the more spread always requires wider spacing for its cultivation. The similar kind of variations for plant spread in cabbage varieties were also recorded by Srihari and Satyanarayans (10) and Znidarcic *et al.* (12). Plant mortality in cabbage varieties was mainly attributed to disease like root rot, collar rot and head rot. The findings also revealed that among 9 hybrids, Blue Diamond and Indica were least affected by these disease with almost negligible per cent of plant mortality i.e. zero or less than 1 per cent. Whereas, contrary to these, the mortality was maximum (27.39 %) in check variety Golden Acre, Similar kind of observations in cabbage/ hybrids was also recorded by Reis *et. al.* (6). As evident from Table 1 that amongst all 10 varieties in the study, check variety, Golden Acre took the minimum days to maturity i.e. 44 days from the date of transplanting, whereas, Suttind Manas and Indica took maximum duration i.e. 63.66 and 63.00 days, respectively. These observations of present study had also been

**Table 1: Performance of different hybrids/varieties of cabbage under mid- hills of Uttarakhand (Pooled (2009 and 2010)).**

Hybrids/ variety	Leaf area (cm <sup>2</sup> )	Number of non-wra pper leaves	Plant spread (cm)	Head size (cm <sup>2</sup> )	Net head weight (kg)	Plant mar- tality (%)	Days to mat- urity	Head compact -ness (g/cm <sup>3</sup> )	Ascorbi c acid content (mg/ 100g)	Yield (q/ha)
Green Hero	685.19	13.73	59.66	397.05	1.19	1.69	53.83	14.39	136.80	441.95
Blue Diamond	724.76	13.28	59.76	464.63	1.36	0.00	53.83	14.78	139.53	544.80
T-50	773.97	14.98	68.56	511.50	2.10	3.60	53.83	19.63	101.70	801.19
Suttind Manas	439.96	12.84	57.66	405.37	1.58	4.08	63.66	19.52	125.68	463.24
Varun	1022.71	13.81	60.80	453.05	1.15	4.99	54.16	12.72	114.48	441.57
T-64	714.08	11.75	59.67	403.82	1.29	13.92	49.16	17.31	115.30	466.77
Indica	897.30	13.58	59.77	423.65	1.37	0.69	63.00	17.37	117.23	525.04
FM-Super	615.15	13.21	57.90	318.24	1.03	6.80	58.00	17.89	122.97	380.63
NBH-Arun	837.26	12.70	62.44	515.05	1.47	10.00	57.66	12.85	125.21	537.29
Golden Acre	444.04	11.82	55.73	311.27	0.91	27.39	44.00	14.84	93.20	269.72

found in conformity with the findings reported by Bhagchandani *et al.* (1), Islami *et al.* (3), Srihari and Satyanarayans (10) and Sharma and Verma (7).

#### (b) Quality and Yield parameters

The quality attributes studied were head compactness and ascorbic acid content. The head compactness was maximum in T-50 (19.63 g/cm<sup>3</sup>) and was closely followed by Suttind Manas (19.52 g/cm<sup>3</sup>) while, the minimum value was in Varun (12.72 g/cm<sup>3</sup>) and NBH-Arun (12.85 g/cm<sup>3</sup>). Similar to the present findings, Swarup and Sharma (11) had also noticed wide range of variations in the head compactness amongst the cabbages cultivars. Whereas, the ascorbic acid was found maximum in hybrid Blue Diamond (139.53 mg/100 g) followed by Green Hero (136.80 mg/100 g) and it was Golden Acre (93.20 mg/100 g) recording the minimum ascorbic acid contents in leaves. Similar kind of variation in leaf ascorbic acid content of broccoli varieties were also reported by Kaur *et al.* (4) study.

With regard to yield parameters viz., head size, net head weight and yield (q/ha) the hybrids NBH-Arun and T-50 produced the largest head size being at par to each other i.e. 515.05 cm<sup>2</sup> and 511.50 cm<sup>2</sup>, respectively. The maximum net head weight (2.106 kg) and yield (801.19 q/ha) was observed in hybrid T-50 was significantly superior over all other for net head weight and yield (q/ha). The minimum yield parameters were found in open pollinated variety *i.e.* Golden Acre. In a similar study Pandey *et al.* (5) reported that yield of cabbage varies greatly depending upon cultivar and early maturing cultivars generally produced lower yield due to a shorter growing season as compared to mid and late cultivar as observed in the present study.

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