



P-ISSN: 2349-8528

E-ISSN: 2321-4902

[www.chemijournal.com](http://www.chemijournal.com)

IJCS 2021; 9(1): 856-858

© 2021 IJCS

Received: 11-11-2020

Accepted: 18-12-2020

**Feroz Ahmad Parry**Assistant Professor, Mountain  
Agriculture Research &  
Extension Station Gurez,  
Bandipora SKUAST-K, Jammu  
and Kashmir, India**Waseem Ali Dar**Assistant Professor, Mountain  
Agriculture Research &  
Extension Station Gurez,  
Bandipora SKUAST-K, Jammu  
and Kashmir, India**Bilal Ahmad Bhat**Assistant Professor, Mountain  
Agriculture Research &  
Extension Station Gurez,  
Bandipora SKUAST-K, Jammu  
and Kashmir, India**Tariq Sultan**Subject Matter Specialist Krishi  
Vigyan Kendra, Bandipora,  
SKUAST-K, J & K, India**Corresponding Author:****Feroz Ahmad Parry**Assistant Professor Mountain  
Agriculture Research &  
Extension Station Gurez,  
Bandipora SKUAST-K, J & K,  
India

## Effect of different combinations of farm yard manure and bio-fertilizers on growth, yield and quality of Chinese cabbage under high altitude climatic conditions of Gurez-J&K

**Feroz Ahmad Parry, Waseem Ali Dar, Bilal Ahmad Bhat and Tariq Sultan**

**DOI:** <https://doi.org/10.22271/chemi.2021.v9.i11.11332>

### Abstract

A field experiment was conducted at experimental farm of Mountain Agriculture Research & Extension Station Gurez, SKUAST-K (J&K) with six treatments (control, 5,10,15,20 and 25 tonnes F.Y.M/ha along with bio-fertilizers azotobactor+ Phosphate solublizing bacteria) during kharif -2019 to find out the optimum combination of F.Y.M and bio-fertilizers for improving growth, yield and quality attributes of Chinese cabbage under high altitude rain fed climatic conditions. Among the treatments studied, significantly highest plant height (33.33 cm), No. of wrapper leaves/plant (18.00), plant spread /plant (111.66 cm), head weight/plant (553.33 g), yield /plot(15.49 kg), yield /hectare 34.42 tonnes, moisture content 98.00% and Vit. C 28 mg/100g were noticed with the application of FYM@25tonnes/hectare along with azotobactor and phosphate solublizing bacteria.

**Keywords:** Azotobactor, bio-fertilizer, Chinese cabbage, FYM, PSB, quality, rain fed

### Introduction

Chinese cabbage (*Brassica pekinensis* and *Brassica chinensis*) is an annually grown as a salad crop. It is indigenous to China and eastern Asia, where it has been in cultivation since the fifth century. Other major areas of production include Korea and Taiwan. Chinese cabbage is also known as Chinese leaves or celery cabbage. Two more or less distinct species of Chinese cabbage are grown. One of these species is Pe-tsai-*Brassica campestris* subsp. *pekinensis* (*Brassica pekinensis*). This resembles Cos lettuce but produces a much larger head that is elongated and compact. The other species is pak-choi- *Brassica campestris* subsp. *chinensis* (*Brassica chinensis*). This resembles Swiss chard in growth habit. The leaves are long, dark green, and oblong or oval, and they do not form a solid head. It is also called Chinese mustard (Kalloo and Rana 1993) [6]. Chinese cabbage is a rich sources of vitamins, minerals, proteins and dietary fiber. Chinese cabbage can be either direct seeded or raised as transplants. Chinese cabbage is eaten raw or lightly cooked. More than 90% of Chinese cabbage harvested in Korea is used for making Kimchi, a fermented side dish eaten throughout the year by virtually every family (Fordham and Hadley, 2003) [5].

Recently, the use of organic materials as fertilizers for crop production has received attention for sustainable crop productivity (Tejada *et al.*, 2009) [12]. Use of organic manures along with bio-fertilizers is not only helpful in improving soil health, growth, yield and quality but also avoids chemical based farming (Bahadur *et al.* 2003; Sable and Bhamare, 2007) [3, 10]. Organically grown foods are more healthier and contains minerals and vitamins than conventional crops (Magkos *et al.* 2003; Bahadur *et al.* 2004) [8, 2] and also improve keeping quality both at room temperature and in storage (Singh, 2006; Umlong, 2010) [11, 13]. Keeping in view, the importance of nutritional rich underutilized leafy vegetable in tribal region, an experiment was carried out to find out the effect of different combinations of farm yard manure and bio-fertilizers on growth, yield and quality of Chinese cabbage under high altitude rain fed climatic conditions.

## Material and Methods

The experiment was conducted at experimental farm of Mountain Agriculture Research and Extension Station, Gurez, SKUAST-K during kharief-2019 as an off-season vegetable in randomized complete block design (RCBD) with six treatments (control, 5, 10, 15, 20 and 25 tonnes F.Y.M/ha along with bio-fertilizers (azotobactor+ Phosphate solublizing bacteria) during kharif -2019, replicated three times. Gurez is a tribal area located at an altitude of (8000-11000 ft above msl) in the northern areas of Jammu and Kashmir Union Territory. The soil has pH 7.0, E.C 0.85 dsm<sup>-1</sup>, OC 0.51%, avg. N 340 kg/ha, avg. P 35 kg/ha, avg. K 230 kg/ha. The seedlings of chinese cabbage var. CITH-1 were transplanted in plots of 3.0 × 1.5 m size at a spacing of 60 × 60 cm in the 1<sup>st</sup> week of June. The sources of different organic manures tried in experiment were applied at the time of land preparation. All recommended cultural practices were adopted to raise the crop. Observations on various growth yield and quality related attributes were recorded, using standard procedures. Moisture content was determined by oven dry method. Vitamin C was estimated by Dye-titration method (AOAC, 1984) [1]. The data thus collected was subjected to analysis of variance, using the method proposed by Panse and Sukhatme (1978) [9].

## Results and Discussion

### Growth and Yield Parameters

It is evident from the data presented in Table 1, that there were significant variations among treatments tried in experiment related to growth and yield related attributes of Chinese cabbage. Among different treatments, T<sub>6</sub>- farm yard manure@25 tonnes along with bio-fertilizers azotobactor and Phosphate solublizing bacteria registered highest plant height (33.33cm), number of wrapper leaves per plant (18.00), plant spread per plant (111.66cm), head weight per plant (553.33g), yield per plot (15.49 kg) and yield per hectare (34.42 t) followed by T<sub>5</sub> and T<sub>4</sub> was found statistically significant as

compared to rest of the treatments.

The improvement of growth and yield parameters of Chinese cabbage might be due to the combined application of farm yard manure and bio-fertilizer that improves soil health, water holding capacity, ensures proper aeration in soil, supply of micro nutrients and availability of major nutrients. Similar results were reported by Mal *et al*; 2015, Kumar *et al*; 2013, and Choudhary *et al*; 2012. Combined application of farm yard manure and bio-fertilizers helps in secretion of growth promoting substances which leads to better root development, translocation of carbohydrates to storage organs, transportation of water, uptake and decomposition of nutrients results more growth and yield attributes (Bhardwaj *et al*; 2007 and Magd *et al*; 2006) [7].

### Quality Parameters

It is evident from the data presented in Table 1, that there were significant variations among treatments tried in experiment related to quality characters of Chinese cabbage. Among different treatments, T<sub>6</sub>- farm yard manure@25 tonnes along with bio-fertilizers (azotobactor and Phosphate solublizing bacteria) registered highest moisture content 98.00% and Vit. C 28 mg/100g followed by T<sub>5</sub> and T<sub>4</sub> was found statistically significant as compared to rest of the treatments. Salisbury and Ross, 1991 reported that the greater amount of K is present in FYM which accelerated the synthesis of ascorbic acid. Application of organic manures influenced the longevity of vegetables due to the increased nutrient uptake by the plants and greater development of water conducting tissues (Chatterjee *et al*; 2014) [4]. Improvement in quality attributes of Chinese cabbage by the application of organic manures helps in secretion of growth promoting substances which leads to better root development, translocation of carbohydrates to storage organs, transportation of water, uptake and decomposition of nutrients results more growth, yield and quality attributes (Bhardwaj *et al*; 2007 and Magd *et al*; 2006) [7].

**Table 1:** Effect of different combinations of FYM and Bio-fertilizers on growth, yield and quality of Chinese cabbage

Treatments	Pl. ht (c.m)	No. of wrapper leaf/pl	Pl. spr (cm)	Head wt./pl (g)	Yld/plot (kg)	Yld/h (t)	Moist. %	Vit. C mg/100g
T <sub>1</sub> . (Control)	14.33	8.33	48.33	263.33	7.37	16.38	84.66	18.73
T <sub>2</sub> . (5 t F.Y.M ha <sup>-1</sup> )+AZB+PSB	19.00	10.66	66.66	356.66	9.98	22.19	88.00	20.73
T <sub>3</sub> . (10 t F.Y.M ha <sup>-1</sup> )+AZB+PSB	22.66	12.33	75.00	410.00	11.48	25.50	91.00	22.33
T <sub>4</sub> . (15 t F.Y.M ha <sup>-1</sup> )+AZB+PSB	25.00	14.00	81.66	453.33	12.69	28.20	93.33	24.33
T <sub>5</sub> . (20 t F.Y.M ha <sup>-1</sup> )+AZB+PSB	28.66	16.00	102.00	503.33	14.09	31.31	95.66	25.93
T <sub>6</sub> . (25 t F.Y.M ha <sup>-1</sup> )+AZB+PSB	33.33	18.00	111.66	553.33	15.49	34.42	98.00	28.00
C.D (P≤0.05)	2.58	1.57	7.33	33.97	0.95	2.11	1.37	1.25
C.V	5.88	6.50	4.92	4.35	4.35	4.35	0.81	2.90

## Conclusion

From the present investigation, it is concluded that application of 25 tonnes farm yard manure ha<sup>-1</sup> along with bio-fertilizers (azotobactor and Phosphate solublizing bacteria) is adequate for maximum growth, yield and quality attributes of Chinese cabbage in the study location.

## References

1. AOAC. Official methods of analysis. 14<sup>th</sup> edn. (S. Williams ed.) 1984, 844-846p. AOAC: Virginia.
2. Bahadur A, Singh J, Singh KP. Response of cabbage to organic manures and biofertilizers. Indian J. Hort 2004;61(3):278-279.
3. Bahadur A, Singh J, Upadhyay AK, Singh KP. Effect of organic manures and biofertilizers on growth, yield and

quality attributes of broccoli (*Brassica oleracea* L. Var. *italica plenck*). Vegetable Science 2003;30(2):192-194.

4. Chatterjee R, Bandhopadhyay S, Jana JC. Organic amendments influencing growth, head yield and nitrogen use efficiency in cabbage (*Brassica oleracea* Var. *capitata* L). American International Journal of Research In Formal, Applied & Natural Sciences 2014;5(1):90-95.
5. Fordham R, Hadley P. Encyclopedia of food sciences and nutrition (second edition) 2003.
6. Kalloo G, Rama MK. Genetic improvement of vegetable crops. Pergamon press 1993, 179-186p.
7. Magd MA, Bassiony AM, Fawzy ZF. Effect of organic manure with or without chemical fertilizers on growth, yield and quality of some varieties of broccoli plants.

- Journal of Applied Sciences Research 2006;2(10):791-798.
8. Magkos F, Araniti F, Zampelas A. Organic food: Nutritious food or food for thought, a review of evidence. International Journal of Food Science and Nutrition 2003;54:357-371.
  9. Panse VG, Sukhatme PV. Statistical methods for Agricultural Workers. ICAR, New Delhi 1978.
  10. Sable PB, Bhamare VK. Effect of biofertilizers (AZB and Azospirillum) alone and in combination reduced levels of nitrogen and quality of cauliflower Cv.snowball-16. Asian Journal of Horticulture 2007;2:215-217.
  11. Singh SR. Resonse of biofertilizers and pesticides on yield and quality of cabbage, radish and brinjal in vegetable based rotation system. Applied Biological Research 2006;8:33-36.
  12. Tejada M, Hernandez MT, Garcia C. Soil restoration using composted plant residues: Effects on soil properties. Soil and Tillage Res 2009;102:109-117.
  13. Umlong RM. Growth, yield and quality of carrot (*Daucus carota* L.) as influenced by organic and lime. M. Sc (Ag.) thesis, Assam Agricultural University, Jorhat 2010.