

## Effect of Doses of Biofertilizers on the Growth and Production of Cabbage (*Brassica Oleracea L. Var. Capitata*)

Dulichand Sharma, Raj Kumar Singh and A.S. Parmar

Department of Horticulture, R.B.S. College, Bichpuri,

Agra- 283105 U.P. India

### Abstract

The field experiments on cabbage crop using azotobacter, azospirillum and VAM were conducted at R.B.S. College, research farm Bichpuri, Agra Uttar Pradesh. The results proved that 4kg ha<sup>-1</sup> dose of each bio-fertilizer resulted the maximum plant height, number of leaves plant<sup>-1</sup>, diameter of stem, length of longest leaf, width of longest leaf and plant spread than other doses. The bio-fertilizer azospirillum enhanced significantly the growth and production and the same also increased the fresh weight of green leaves plant<sup>-1</sup> to the extent of 25.85% and 15.24% over azotobacter and VAM, respectively. The azospirillum significantly enhanced the total production of trimmed head of cabbage to the extent of 7.06% than azotobacter. The 4 kg ha<sup>-1</sup> dose of each bio-fertilizer showed significant favourable effect on production than 2 kg ha<sup>-1</sup> dose of each bio-fertilizer and even than 6 kg ha<sup>-1</sup> dose of azotobacter and azospirillum.

**Key words:** Bio-fertilizers, doses, growth, yield, cabbage.

### Introduction

The azotobacter, azospirillum [3] and VAM are the main bio-fertilizers which are biologically active products containing bacteria or fungi as a single or composite cultures and thus they improve soil health and fertility. They can add 20-

100 kg N ha<sup>-1</sup> and solubilize 30-50 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>. They liberate growth promoting substances and vitamins which may increase crop yield by 10-15%<sup>[2]</sup>. This paper contributes information regarding the impact of azotobacter, azospirillum and VAM on the growth and production of cabbage under semi-arid conditions.

### Material and method

A field experiment with three doses as 2 kg ha<sup>-1</sup> (D<sub>1</sub>), 4 kg ha<sup>-1</sup> (D<sub>2</sub>), and 6 kg ha<sup>-1</sup> (D<sub>3</sub>) of azotobacter (B<sub>1</sub>), azospirillum (B<sub>2</sub>) and VAM (B<sub>3</sub>) was conducted on research farm of R.B.S. College, Bichpuri,

Agra during two rabi seasons of 2008-09 and 2009-10 following Randomized Block Design with three replications. A uniform application of 200 kg N ha<sup>-1</sup>, 60 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and 60 kg K<sub>2</sub>O ha<sup>-1</sup> was done through urea, single super phosphate and muriate of potash, respectively. The half quantity

**Table 1 – Effect of bio-fertilizers and their doses on the growth characters of cabbage (Mean of two years)**

Treatments		Height (cm)	No. of leaves (plant <sup>-1</sup> )	Diameter of stem (cm)	Length of longest leaf (cm)	Width of longest leaf (cm)	Spread in cross (cm)	Spread in along (cm)
Bio-fertilizers	Doses (Kg ha <sup>-1</sup> )							
Azotobacter (B <sub>1</sub> )	2.0 (D <sub>1</sub> )	21.30	14.33	1.75	25.69	23.99	49.04	50.31
	4.0 (D <sub>2</sub> )	21.05	14.44	1.35	25.82	21.59	49.90	48.61
	6.0 (D <sub>3</sub> )	21.19	12.11	1.58	25.47	24.60	48.74	49.90
Azospirillum (B <sub>2</sub> )	2.0 (D <sub>1</sub> )	25.32	15.11	1.67	27.23	24.93	54.15	50.03
	4.0 (D <sub>2</sub> )	24.17	15.55	1.76	25.65	24.33	51.93	52.83
	6.0 (D <sub>3</sub> )	21.46	18.22	1.56	23.20	22.84	49.23	50.93
VAM (B <sub>3</sub> )	2.0 (D <sub>1</sub> )	19.62	15.11	1.54	24.83	23.81	49.08	50.00
	4.0 (D <sub>2</sub> )	19.53	15.11	1.50	23.84	24.39	46.71	49.84
	6.0 (D <sub>3</sub> )	21.17	13.44	1.62	28.02	28.21	49.63	49.64
CD at 5% B		2.192	1.981	NS	NS	NS	NS	NS
D		NS	NS	NS	NS	NS	NS	NS
B x D		NS	NS	0.209	3.361	NS	NS	NS

of nitrogen and full quantity of phosphorus and potassium were applied as basal dose and remaining half quantity of nitrogen was

applied as top dressing after one month of planting. The bio-fertilizers were applied before planting as per experimental treatments. The five weeks age seedlings of cabbage were planted in well prepared plots at a distance of 50 cm in the evening hours of November 30 during 2008 and 2009 followed by a light of longest leaf, plant spread in-across and in-along in comparison to other doses D<sub>1</sub> and D<sub>2</sub>. The bio-fertilizer azospirillum resulted significantly more plant height and number of leaves plant<sup>-1</sup> as compared to azotobacter and VAM. However,

irrigation. The experimental soil was sandy loam in nature. In all five irrigations were given to grow the crop. The crop was harvested on March 15, 2009 and March 20, 2010 and growth and yield data were recorded and statistically analysed.

### Results and Discussion

The data given in Table-1 revealed that 4 kg ha<sup>-1</sup> dose (D<sub>2</sub>) of bio-fertilizers produced the maximum plant height, number of leaves plant<sup>-1</sup>, diameter of stem, length of longest leaf, width difference between D<sub>2</sub> and D<sub>3</sub> did not differ statistically. The interactions B x D were found significant in case of diameter of plant stem and length of largest leaf. These findings confirm the opinion of many researchers [1, 2, and 4] who have

mentioned beneficial effect of bio-fertilizers on crop growth due to liberation of growth promoting substances.

**Table 2 – Effect of bio-fertilizers and their doses on the production of cabbage (Mean of two years)**

Treatments		Fresh weight of green leaves plant <sup>-1</sup> (kg)	Fresh weight of trimmed head plant <sup>-1</sup> (kg)	Total production of trimmed head (q ha <sup>-1</sup> )	Dry matter yield (100 gm <sup>-1</sup> )	
Bio-fertilizers	Doses (Kg ha <sup>-1</sup> )				Chopped leaves	Chopped head
Azotobacter (B <sub>1</sub> )	2.0 (D <sub>1</sub> )	490.23	0.68	145.08	11.33	11.43
	4.0 (D <sub>2</sub> )	527.77	0.74	162.13	12.60	11.67
	6.0 (D <sub>3</sub> )	519.52	0.72	152.10	11.60	10.50
Azospirillum(B <sub>2</sub> )	2.0 (D <sub>1</sub> )	615.55	0.80	153.60	10.67	11.17
	4.0 (D <sub>2</sub> )	672.77	0.98	178.13	11.60	12.50
	6.0 (D <sub>3</sub> )	646.66	0.55	160.01	11.17	12.50
VAM (B <sub>3</sub> )	2.0 (D <sub>1</sub> )	510.23	0.67	153.60	12.33	12.83
	4.0 (D <sub>2</sub> )	588.36	0.94	168.59	10.53	12.33
	6.0 (D <sub>3</sub> )	580.42	0.67	164.18	11.23	10.33
CD at 5% B		21.78	NS	4.41	NS	NS
D		21.78	NS	4.41	NS	NS
B x D		37.33	0.169	7.64	NS	NS

The data presented in Table-2 showed that use of azospirillum significantly enhanced the fresh weight of green leaves plant<sup>-1</sup> in comparison to azotobacter and VAM. While VAM (D<sub>3</sub>) resulted significantly more fresh weight of green leaves plant<sup>-1</sup> as compared with azotobacter application. The azospirillum application increased the fresh weight of green leaves plant<sup>-1</sup> to the extent of 25.85 and 15.24 over azotobacter and VAM, respectively. The 4 kg ha<sup>-1</sup> dose of each bio-fertilizer proved significantly better than 2 kg ha<sup>-1</sup> and 6 kg ha<sup>-1</sup> doses. The 4 kg ha<sup>-1</sup> dose of azospirillum and VAM proved significantly better than 2 kg

ha<sup>-1</sup> dose of these bio-fertilizers regarding fresh weight of trimmed head plant<sup>-1</sup>. The bio-fertilizer azospirillum resulted significantly 7.06% more total production of trimmed head of cabbage than azotobacter. The 4 kg ha<sup>-1</sup> dose of each bio-fertilizer showed significantly better impact than 2 kg ha<sup>-1</sup> dose of each bio-fertilizer and even more than 6 kg ha<sup>-1</sup> dose in case of azotobacter and azospirillum. There was no statistical effect of treatments on dry matter production of chopped leaves and chopped heads of cabbage at final stage. Hence use of azospirillum and its 4 kg ha<sup>-1</sup> dose

resulted better performance of cabbage regarding growth and yield as compared with azotobacter and VAM in this experimental <sup>[1,3,4]</sup> and order of effectiveness could be arranged as azospirillum > VAM > azotobacter bio-fertilizers.

#### References

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