Journal of Crop and Weed, 5(2): 75-77 (2009)

Response of nitrogen and phosphorus levels on the growth and yield of chinese cabbage (*Brassica campestris* L. var. *pekinensis*) in the gangetic plains of West Bengal

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ABSTRACT

Adequate quantities of plant nutrients are required to promote proper crop growth with view to achieve success in vegetable production. A field experiment was conducted on response of chinese cabbage to different doses of nitrogen and phosphorus levels. The aim of this research was to assess the performance of two fertilizers in different doses for growth, yield and quality of chinese cabbage. Analysis of variance showed significant differences among the treatments for all the traits. The maximum number of outer leaves, head length, head width, total head weight, net head weight and head yield were obtained with the application of 120kg N/ha and 100kg P/ha .Where as the maximum plant height, plant spread, leaf area and head diameter were recorded with the application of 140kgN/ha and 120kgP/ha. From the experiment, suggested that the application of 120kg nitrogen /ha and 100kg P/ha are best for obtaining higher production in chinese cabbage in the Gangetic plains of West Bengal.

Key words: Chinese cabbage, growth, nutrient management, productivity and yield.

Chinese cabbage (*Brassica campestris* L. var. *pekinensis*) is one of the important vegetable in eastern India. In China it is widely grown vegetable and northern parts it accounts for nearly 25% of the total annual vegetable consumption. In Japan it is also popular, ranking third after radish and cabbage. In Korea it is undoubtedly most important vegetable, both in terms of production, area and per capita consumption. In recent years, chinese cabbage is becoming popular in India as pot herb, salad and cooked vegetable also. chinese cabbage is low in calories, fats and carbohydrates but it is a good source of minerals, protein and antioxidants (Singh *et al*., 2004). Several studies revealed that the sewage sludge can be efficiently utilized for production of chinese cabbage without any toxicity of heavy metals (Chui *et al.,* 1992). Considering the role of vegetables for nutritional and food security around 110 million tonnes of vegetables have to be produces by the turn of this century to meet at least the minimum requirement of vegetable per capita per day. For realizing high production of vegetable per unit area, soil health is an essential factor. Unfortunately soil fertility is principally responsible for low productivity of vegetables in India. The indiscriminate use of fertilizers has detrimental effect of soil health in terms of NPK rates. A nationwide assessment of nutrient deficiency reveals that nitrogen deficiency is universal and will continue to be so, and nearly 49, 20, 47% of Indian soils are deficient in phosphorus, potash and zinc, respectively.

MATERIALS AND METHODS

The experiment was conducted during winter season of 2007-08 at Horticultural Research Station, Mondouri, BCKV, Nadia, West Bengal. The experiment was laid out in a Factorial Randomized Block Design having two factors *i.e.,* nitrogen and phosphorus with three replications. The treatments include four levels of nitrogen and three levels of phosphorus. Total numbers of treatments combinations were 12. The treatment details were as (i) Levels of nitrogen (N) - N_1: 80 kg; N_2: 100 kg; N_3: 120 kg; N_4: 140 kg; (ii) Levels of phosphorus (P) - P_1: 60 kg; P_2: 80 kg; P_3: 100 kg.). One month old seedlings of chinese cabbage were transplanted in plots of 2 x 2m. Half dose of nitrogen and full dose of phosphorus and potash were given as basal dose. Remaining nitrogen was given in two split doses. Ten plants from each plot were selected for taking observations on growth and yield parameter. The data were analyzed statistically

RESULTS AND DISCUSSION

Effect of nitrogen

The increasing levels of nitrogen from 100-140 kg /ha had significantly increased the growth characters and yield (Table 1). Significantly maximum plant height (32.14 cm), plant spread (3360.48 cm^2) and head diameter (46.59 cm) were recorded at 140 kg N /ha., number of outer leaves (6.13), leaf area (914.42 cm), total head weight (1.53 kg), head yield/plot (12.99 kg.) and head yield/ha. (259.91 q.) were found maximum at 120 kg N/ha. Maximum head length (28.96 cm) and net head weight (0.81 kg.) were recorded at 100 kg N/ha. Krezel and Koota (2004) observed that application of 100 + 50 kg N/ha resulted in the highest total and marketable yield. The results are also similar with the

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findings of Felozynski *et al*. (2004) and Staugaitis and Viskeli (2005) .

Effect of phosphorus

Application of phosphorus showed significantly effect on growth and yield character of Chinese cabbage. The increasing levels of phosphorus from 80-100 kg/ha had progressively increased the plant height (30.73 cm), plant spread (2980.75c m), number of outer leaves (6.93) , leaf area (844.33 cm), head diameter (46.35 cm), head length (29.59 cm), total head weight (1.47 kg), net head weight (0.82 kg), head yield /plot (13.12 kg) and head yield/ha (262.40 kg) were recorded maximum at 100 kg phosphorus/ha. The maximum values with respected to growth, yield and quality characters were obtained at the highest level of nitrogen, phosphorus and potassium which are known to promote plant growth by virtue of their association in cell elongation, cell division, promotion of ADP activities, root development and regulation the stomatal activities in the leaves. These results are in accordance with findings of Kumar and Sharma (2001).

Interaction effect of nitrogen and phosphorus

The combined effect of nitrogen and phosphorus was found significant for most of the characters of chinese cabbage (Table-1). Combined application of 100 kg nitrogen and 100 kg phosphorus /ha (N_2P_3) recorded maximum number of outer leaves (7.89), head diameter (48.98 cm), head length (32.40 cm), net head weight (0.92 kg), head yield (14.72 kg) and head yield /ha (294.04 q). The combined application of 120 kg nitrogen and 100 kg phosphorus/ha (N_3P_3) recorded maximum plant height (32.57 cm), leaf area (972.43 cm) and total head weight (1.63 kg). The increasing levels of nitrogen and phosphorus (N_4P_3) had increased plant spread (3458.78 cm^2). The interaction effect between cultivars and NPK combination was significant for all the characters under study (Fig.1).

Thus, the results of the experiment indicated a significant response of nitrogen and phosphorus with respect to growth and yield characters of chinese cabbage. Balanced use of nitrogen and phosphorus significantly increased the head weight, head yield and reduced the percentage of deformed head as well as percentage of unmarketable head compared to lower dose of nitrogen and phosphorus. Hence, the application of 120 kg nitrogen with 100 kg phosphorus (N_2P_3) was found beneficial for growth and yield of chinese cabbage under Gangetic plains of West Bengal.

REFERENCES

Chui, V.W.D., Lam Leung, S. Y. and Cheung, M. 1992. The use of sewage sludge as basal dressing for vegetable cultivation. *Env. Int.*, **18**: 201-09.

Felczynski, K., Adamicki, F. and Felczynska, A. 2004. Effect of different rates of nitrogen fertilization on the yield and storability of chinese cabbage. *Nowoski Warzywnicze,* **39**: 55-56.

Krezel, J. and Koota, E. 2004. The effect of nitrogen fertilization on yield and biological value of chinese cabbage grown from seed growing for autumn harvest. *Folia Universitatis Agriculturae Stetinensis Agricultura*, **95**:197-200.

Kumar P and Sharma S.K. 2001. Performance of different sprouting broccoli (*Brassica oleracea* var italic) cultivars under different combinations NPK. *Indian* J. *Agric. Sc*., **71**:558-60.

Singh, J., Upadhayay, A. K., Bahadur, A. and Singh, K. P. 2004. Dietary antioxidants and minerals in crucifers. *J. Veg. Crop Prod*., **10:**33-41.

Staugaitis, G. and Viskelis, P. 2005. Amounts of nitrogen, phosphorus, potassium, calcium and magnesium in the heads and plant residues of chinese cabbage crops fertilized with different rate of nitrogen. *Sodininkysteir Darzninkyste*, **24** : 98-106.

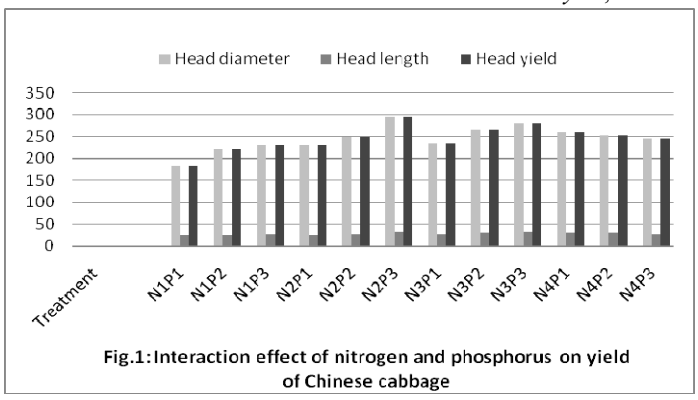

Fig.1: Interaction effect of nitrogen and phosphorus on yield of Chinese cabbage

Table 1: Response of nitrogen and phosphorus levels on the growth and yield of chinese cabbage

Treatments	Plant height (cm.)	Plant spread (cm^2.)	No. of outer leaves	Leaf area (cm^2.)	Head diameter (cm.)	Head length (cm.)	Total head weight (kg.)	Net head weight (kg.)	Head yield (kg./plot)	Head yield q./ha
Nitrogen (N)										
N_1	26.89	2486.81	4.78	651.75	40.69	26.57	1.21	0.66	10.58	211.56
N_2	28.89	2636.57	5.95	779.51	44.12	28.96	1.38	0.81	12.89	257.78
N_3	30.43	2876.77	6.13	914.42	45.68	28.85	1.53	0.81	12.99	259.91
N_4	32.14	3360.48	5.46	865.62	46.59	28.75	1.34	0.79	12.64	252.80
SEm (±)	**0.196**	**43.556**	**0.053**	**9.348**	**0.263**	**0.234**	**0.034**	**0.016**	**0.250**	**5.001**
LSD(0.05)	**0.407**	**90.331**	**0.110**	**19.387**	**0.546**	**0.485**	**0.070**	**0.032**	**0.519**	**10.371**
Phosphorus (P)										
P_1	28.578	2723.76	4.99	763.71	42.33	27.28	1.25	0.71	11.33	226.67
P_2	29.459	2815.96	5.38	800.43	44.13	27.98	1.38	0.77	12.37	247.47
P_3	30.729	2980.75	6.39	844.33	46.35	29.59	1.47	0.82	13.12	262.40
SEm (±)	**0.1698**	**37.721**	**0.047**	**8.096**	**0.228**	**0.203**	**0.029**	**0.014**	**0.217**	**4.331**
LSD(0.05)	**0.352**	**78.229**	**0.096**	**16.789**	**0.473**	**0.420**	**0.061**	**0.028**	**0.449**	**8.982**
Nitrogen x Phosphorus (N x P)										
N_1P_1	26.17	2454.70	4.28	623.76	39.79	26.20	1.03	0.57	9.17	183.47
N_1P_2	26.75	2483.62	4.42	653.63	40.03	26.33	1.27	0.69	11.09	221.87
N_1P_3	27.77	2522.11	5.65	677.85	42.25	27.19	1.33	0.72	11.47	229.33
N_2P_1	26.89	2515.02	4.75	655.82	40.55	26.33	1.23	0.72	11.47	229.33
N_2P_2	29.19	2668.30	5.23	755.73	42.84	28.15	1.32	0.78	12.48	249.60
N_2P_3	30.60	2726.38	7.89	926.99	48.98	32.40	1.59	0.92	14.72	294.40
N_3P_1	29.15	2682.02	5.22	828.88	42.01	27.30	1.39	0.73	11.68	233.60
N_3P_2	29.58	2732.58	6.40	941.94	47.32	28.69	1.57	0.83	13.28	265.60
N_3P_3	32.57	3215.72	6.78	972.43	47.70	30.56	1.63	0.88	14.03	280.53
N_4P_1	32.11	3243.29	5.70	946.39	46.95	29.27	1.33	0.81	13.01	260.27
N_4P_2	32.32	3379.36	5.45	850.41	46.34	28.72	1.35	0.79	12.64	252.80
N_4P_3	31.98	3458.78	5.23	800.06	46.47	28.25	1.34	0.77	12.27	245.33
SEm (±)	**0.339**	**75.442**	**0.093**	**16.191**	**0.456**	**0.405**	**0.058**	**0.027**	**0.433**	**8.662**
LSD(0.05)	**0.705**	**156.457**	**0.191**	**33.578**	**0.946**	**0.840**	**0.121**	**0.056**	**0.898**	**17.963**