

Organic Farming Practices on Different Kohlrabi (*Brassica oleraceae* var. *gongylodes*) Cultivars

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Abstract

An experiment was conducted at Horticultural Farm of Sher-e-Bangla Agricultural University, Dhaka, Bangladesh during October to December 2008, to study the effect of organic farming practices on different kohlrabi (*Brassica oleraceae* var. *gongylodes*) cultivars. The experiment was conducted in split-plot Randomized Complete Block Design with three replications. Two factors were used in the experiment viz. four types of organic manures viz., OM₀=Control/no manure, OM₁=Cowdung (30 t ha⁻¹), OM₂=Poultry manure (25 t ha⁻¹) and OM₃=Vermicompost (20 t ha⁻¹) and five cultivars of kohlrabi viz. V₁=Quick star, V₂=UFO, V₃=White Vienna, V₄=Sufala-14 and V₅=Early 0058 were used in the experiment. In case of different cultivars, the higher plant (40.80 cm), number of leaves (16.73), leaf length (33.40 cm), leaf breadth (15.00 cm), fresh leaves weight plant⁻¹ (155.20 g), diameter of knob (9.32 cm), knob weight (366.60 g), yield ha⁻¹, (27.14 t ha⁻¹) were found in white Vienna (V₃). In case of organic manures, the maximum plant height (36.50 cm), plant canopy (63.50 cm), leaf length (30.42 cm), leaf breadth (14.25 cm), fresh leaves weight plant⁻¹ (131.10 g), diameter of knob (8.23 cm), knob weight (366.60 g), yield ha⁻¹ (22.90 t ha⁻¹) were found by poultry manure (OM₂) application. In case of combined effect of organic manures and different kohlrabi cultivars, the maximum plant height (43.00 cm), plant canopy (73.00 cm), leaf length (38.00 cm), diameter of knob (10.17 cm), Knob weight (442.70 g), yield ha⁻¹ (32.78 t ha⁻¹) were found in white Vienna (V₃) with poultry manure (OM₂). The maximum number of leaves (16.73) were found in quick star (V₁) with control (OM₀), the maximum leaf breadth (15.00 cm) were found in sufala-14 (V₄) with Vermicompost (OM₃), the maximum fresh leaves weight plant⁻¹ (155.20 g) were found in sufala-14 (V₄) with poultry manure (OM₂).

1. Introduction

Kohlrabi (*Brassica oleraceae* var. *gongylodes*) belongs to family Brassicaceae and considered as a cole crop and its edible portion is enlarged stem (knob). It is well known that, kohlrabi has enormous nutritional and medicinal values due to its high contents of vitamins (A, B₁, B₂, B₅, B₆ and E), minerals (Ca, Mg, Zn and Fe) and antioxidant substances which prevent the formation of cancer causing agents (Beecher, 1994). Kohlrabi is widely cultivated in European and American countries. In Bangladesh, still it is grown in a very limited scattered areas and the total cultivated area is not exactly known. Organic matter is a source of food for the innumerable number of micro organisms and creatures like earthworm who breaks down these to micronutrients, which are easily absorbed by the plants. Organic manure plays a direct role in plant growth

as a source of all necessary macro and micronutrients in available forms during mineralization, improving the physical and physiological properties of soils. Organic manures such as cowdung, poultry manure and vermicompost improves the soil structure, aeration, release the nutrients slowly thus support root development leading to higher growth and yield of kohlrabi plants (Abou El-Magd et al. 2005). The macronutrients like calcium and micronutrients such as boron, manganese, molybdenum and iron are important for cole crop development. Justification for practicing organic farming in kohlrabi seems to be inadequate from the recently available literature, hence, this experiment was conducted.

2. Materials and Methods

The experiment was conducted at Horticulture Farm in Sher-e-Bangla Agricultural University, Dhaka during October to

December 2008. The area had sub tropical climate characterized by high temperature (28°-32°C) accompanied by moderately high rainfall during *kharif* (April-September) season and low temperature (15°-20°C) in the *Rabi* (October-March) season. The soil of the experimental field was silty clay in texture with pH 6.0, available N- 0.078%, available P- 0.88% (medium), available K- 0.0053% and organic matter - 0.82 %. The soil belongs to the *Modhupur* tract, AEZ-28 (FAO, 1988). The experiment was laid out by split-plot Randomized Complete Block Design with three replications. Two factors were used in the experiment viz. four types of organic manures viz., OM₀=Control/ no manure, OM₁=Cowdung (30 t ha⁻¹), OM₂=Poultry manure (25 t ha⁻¹) and OM₃=Vermicompost (20 t ha⁻¹) and five cultivars of kohlrabi viz., V₁=Quick star, V₂=UFO, V₃=White Vienna, V₄=Sufala-14 and V₅=Early 0058. Seeds of different cultivars of kohlrabi were collected from khustia seed store Mirpur-11, Dhaka. The seeds were sown on 9th October 2008, on a raised bed. The plot size was 3.0 x 1.8 m² and spacing was 45x30 cm². The nutrient content of the organic manures tried viz., cowdung, poultry manure and vermicompost were 0.4, 0.3 and 0.3; 1.0, 0.6 and 0.45; 0.5, 0.25% N, P and K, respectively. All the organic manures as per the treatments were applied and incorporated into the soil one week before transplanting. There was no incidence of insects and diseases. Randomly selected ten plants were harvested from each plot for data collection. Data were collected on plant height (cm), plant canopy (cm), number of leaves plant⁻¹, leaf length (cm), leaf breadth (cm), weight of leaves plant⁻¹, diameter of knob(cm), knob weight (g), yield (t ha⁻¹). The means were separated by DMRT at 5% level of significance (Gomez and Gomez, 1984).

3. Results and Discussion

3.1. Plant height

Different kohlrabi cultivars had significant influence on plant height of kohlrabi plants (Table 1). The taller plant (40.80 cm) was observed in White Vienna (V₃) and the smallest plant (8.8 cm) was found in Early 0058 (V₅). Application of different

organic manures exhibited a non significant influence on the height of kohlrabi plants (Table 2). Plant height ranged from 32.25 cm to 36.50 cm. The highest plant height (36.50 cm) was recorded from poultry manure (OM₂) and the lowest (32.25 cm) was recorded from control treatment (OM₀). These results were coincided with those reported by Fong et al. (1996). Plant height was significantly influenced on combined effect of organic manures and variety (Table 3). The highest plant (43.00 cm) was recorded from White Vienna with poultry manure (OM₂V₃) and the lowest plant (20.00 cm) was found in UFO with control treatment (OM₀V₂).

3.1.2. Number of leaves plant⁻¹

Different kohlrabi cultivars had a significant influence on number of leaves of kohlrabi plants (Table 1). The maximum number of leaves plant⁻¹ (17.53) was observed in Quick star (V₁) and the minimum number of leaves plant⁻¹ (11.9) was found in Early 0058 (V₅). Application of different organic manures exhibited a significant influence on the number of leaves of kohlrabi plants (Table 2). Number of leaves plant⁻¹ ranged from 14.33 to 20.00. The maximum number of leaves (20.00) was found in control treatment (OM₀) and the minimum (14.33) was found in cowdung (OM₁). Number of leaves plant⁻¹ was significantly influenced by combined effect of organic manures and variety. The maximum number of leaves plant⁻¹ (25.0) was recorded from Quick star with poultry manure (OM₂V₁) and the minimum number of leaves (13.0 cm) was found in White Vienna with control treatment (OM₀V₃).

3.1.3. Leaf length

Leaf length was significantly influenced on different cultivars of kohlrabi plants (Table 1). The largest leaf (33.40 cm) was found in White Vienna (V₃) and the smallest leaf (15.0 cm) was found in Early 0058 (V₅). Organic manures had a significant influence on the length of leaves of kohlrabi plants (Table 2). Leaf length ranged from 24.92 cm to 30.42 cm. The largest leaf (30.42 cm) was recorded from poultry manure (OM₂), which was statistically similar to that of vermicompost (OM₃).

Table 1: Effect of different varieties on plant height, no. of leaves, leaf length, leaf breadth, fresh leaves weight, diameter of knob and knob weight on kohlrabi plants

Varieties	Plant height (cm)	No. of leaves	Leaf length (cm)	Leaf breadth (cm)	Weight of leaves (g)	Diameter of knob (cm)	Knob weight (g)
V ₁	25.53 ^b	17.53 ^a	19.00 ^d	8.66 ^b	36.71 ^b	6.22 ^c	148.2 ^c
V ₂	37.40 ^a	16.53 ^{ab}	29.93 ^b	13.53 ^a	124.9 ^a	8.89 ^{ab}	316.9 ^a
V ₃	40.80 ^a	16.73 ^{ab}	33.40 ^a	15.00 ^a	155.2 ^a	9.32 ^a	366.6 ^a
V ₄	34.80 ^a	14.83 ^b	26.07 ^c	12.27 ^a	115.8 ^a	7.50 ^{bc}	241.5 ^b
V ₅	18.80 ^c	11.90 ^c	15.0 ^c	4.50 ^c	57.80 ^b	2.30 ^d	88.20 ^d
LSD (<i>p</i> =0.05)	5.879	2.644	3.358	3.020	38.28	1.525	58.38
CV (%)	10.15	9.50	7.25	12.29	11.71	13.10	12.20

Table 2: Effect of different organic manures on plant height, no. of leaves, leaf length, leaf breadth, fresh leaves weight, diameter of knob and knob weight on kohlrabi plants

Organic sources	Plant height (cm)	No. of leaf	Leaf length (cm)	Leaf breadth (cm)	Fresh leaves Weight (g)	Diameter of knob (cm)	Knob weight (g)
OM ₀	32.25 ^a	20.00 ^a	24.92 ^b	10.75 ^b	86.97 ^b	7.95 ^a	177.50 ^c
OM ₁	33.92 ^a	14.33 ^c	26.42 ^b	11.42 ^{ab}	113.8 ^{ab}	7.96 ^a	241.46 ^{bc}
OM ₂	36.50 ^a	17.25 ^b	30.42 ^a	14.25 ^a	131.1 ^a	8.23 ^a	366.60 ^a
OM ₃	34.75 ^a	14.42 ^c	27.83 ^{ab}	12.50 ^{ab}	122.3 ^{ab}	8.00 ^a	316.93 ^{ab}
LSD ($p=0.05$)	5.879	2.644	3.358	3.020	38.28	1.525	58.38
CV (%)	10.15	9.50	7.25	12.29	11.71	13.10	12.20

while the smallest leaf (24.92 cm) was recorded from control treatment (OM₀). In addition, organic manures are slow release nutrients all over the growth season. Poultry manure is rich in its nitrogen and nutrient content. This favorable condition creates better nutrient absorption and favors for vegetative growth. Consequently highest leaf length was found by poultry manure. Similar reports were recorded by other investigator such as Abou El-Magd et al. (2006). Leaf length was significantly influenced on combined effect of cultivars and organic manures

(Table 3). The maximum leaf length (38.0 cm) was recorded from White Vienna with poultry manure (OM₂V₃) and the minimum leaf length (15.33 cm) was observed from White Vienna with control treatment (OM₀V₃).

3.1.4. Leaf breadth

The leaf breadth of kohlrabi plant is important morphological character that influences the yield, because it is correlated with photosynthesis by the higher leaf area. Different cultivars of

Table 3: Combined effect of varieties and organic manures on plant height, no. of leaves, leaf length, leaf breadth and fresh leaves weight on kohlrabi plants

Treatments	Plant height (cm)	No. of leaf	Leaf length (cm)	Leaf breadth (cm)	Wt. of leaf (g)
OM ₀ V ₁	23.00 ^{fg}	19.00 ^{bc}	18.00 ^{hi}	6.33 ^f	43.17 ^{jk}
OM ₁ V ₁	33.00 ^{cd}	13.67 ^{fg}	28.00 ^e	12.00 ^{cd}	95.33 ^{fg}
OM ₂ V ₁	39.00 ^{ab}	25.00 ^a	31.67 ^{cd}	13.00 ^{bc}	134.80 ^{bc}
OM ₃ V ₁	38.00 ^{ab}	13.67 ^{fg}	27.00 ^{ef}	13.00 ^{bc}	147.80 ^{bc}
OM ₀ V ₂	20.00 ^g	16.33 ^{cd}	17.00 ^{ij}	12.00 ^{cd}	25.33 ^{kl}
OM ₁ V ₂	35.00 ^{bc}	15.00 ^{ef}	31.67 ^{cd}	16.00 ^{ab}	161.5 ^{bc}
OM ₂ V ₂	41.00 ^{ab}	21.00 ^b	35.00 ^{ab}	15.00 ^{ab}	166.00 ^b
OM ₃ V ₂	36.00 ^{bc}	16.67 ^{cd}	32.33 ^{bc}	13.00 ^{bc}	120.80 ^{cd}
OM ₀ V ₃	21.00 ^{fg}	13.00 ^h	15.33 ^j	6.00 ^f	31.70 ^{kl}
OM ₁ V ₃	36.00 ^{bc}	15.00 ^{ef}	21.00 ^{gh}	11.33 ^d	111.40 ^{de}
OM ₂ V ₃	43.00 ^a	15.33 ^{ef}	38.00 ^a	18.00 ^a	213.00 ^a
OM ₃ V ₃	38.00 ^{ab}	13.33 ^{gh}	20.67 ^{gh}	10.00 ^{de}	136.70 ^{bc}
OM ₀ V ₄	27.00 ^{ef}	15.00 ^{ef}	25.67 ^{ef}	12.00 ^{cd}	64.00 ^{ij}
OM ₁ V ₄	32.00 ^{de}	14.67 ^{ef}	29.00 ^{de}	12.00 ^{cd}	74.33 ^{hi}
OM ₂ V ₄	40.00 ^{ab}	17.00 ^{cd}	36.00 ^{ab}	16.00 ^{ab}	140.90 ^{bc}
OM ₃ V ₄	41.00 ^{ab}	16.00 ^{de}	34.00 ^{bc}	17.00 ^a	156.00 ^{bc}
OM ₀ V ₅	21.67 ^{fg}	18.33 ^{bc}	19.00 ^{hi}	7.00 ^{ef}	19.33 ^h
OM ₁ V ₅	31.00 ^{ab}	14.33 ^{ef}	24.00 ^{fg}	12.00 ^{cd}	100.00 ^{ef}
OM ₂ V ₅	39.00 ^{ab}	18.67 ^{bc}	35.00 ^{ab}	15.00 ^{ab}	130.70 ^{bc}
OM ₃ V ₅	35.00 ^{bc}	14.67 ^{ef}	23.67 ^{ef}	10.67 ^d	90.50 ^{gh}
LSD ($p=0.05$)	5.879	2.644	3.358	3.020	38.28
CV (%)	10.15	9.50	7.25	12.29	11.71

kohlrabi plants had a significant influence on leaf breadth. The largest leaf (15 cm) was found in White Vienna (V_3) and the smallest leaf (4.5 cm) was observed in Early 0058 (V_5). Application of organic manures exhibited a significant influence on leaf breadth of kohlrabi plants (Table 2). Leaf breadth ranged from 10.75 cm to 14.25 cm. The largest leaf (14.25 cm) was recorded from poultry manure (M_2), which was statistically similar to that of cowdung (OM_1) and vermicompost (OM_3) while the minimum leaf breadth (10.75 cm) was observed in control treatment (OM_0). Poultry manure is rich in its nitrogen and nutrient content which enhance vegetative growth and photosynthetic activity of kohlrabi plants. Leaf breadth was significantly influenced by combined effect of different cultivars and organic manures (Table 3). The maximum leaf breadth (17.0 cm) was recorded from White Vienna with poultry manure (OM_2V_3) and the minimum leaf breadth (6.0 cm) was observed from White Vienna with control treatment (OM_0V_3).

3.1.5. Fresh leaves weight

Different cultivars of kohlrabi plants had a significant influence on fresh leaves weight of kohlrabi plants (Table 1). The maximum leaves weight (155.2 g) was recorded from White Vienna (V_3) and the minimum leaves weight (36.71 g) was found in Quick star (V_1). Application of organic manures exhibited a significant influence on fresh leaves weight of kohlrabi plants (Table 2). Fresh leaves weight ranged from 86.97 g to 131.10 g. The maximum fresh leaves weight (131.10 g) was recorded from poultry manure (OM_2), which was statistically similar to that of cowdung (OM_1) and vermicompost (M_3) and the minimum fresh leaves weight (86.97 g) was observed in control treatment (OM_0). This might be due to the fact that poultry manure enhances its role in photosynthesis, energy storage, cell division and cell enlargement. Similar effects have been reported by Singh (2004) and Sharma et al. (2002). Fresh leaves weight was also significantly influenced by the combined effect of different cultivars and organic manures (Table 3). The maximum leaves weight (240 g) was recorded from White Vienna with poultry manure (OM_2V_3) and the minimum leaves weight (19.33 g) was observed from Early 0058 with control treatment (OM_0V_5).

3.1.6. Diameter of knobs

Diameter of knobs was significantly influenced on different kohlrabi cultivars (Table 1). The maximum diameter (9.32 cm) was recorded from White Vienna (V_3) and the minimum diameter (2.3 cm) was found in Early 0058 (V_5). Organic manures did not exhibit a significant influence on knob diameter of kohlrabi plants (Table 2). Knob diameter ranged from 7.95 cm to 8.23 cm. The maximum knob diameter (8.23 cm) was recorded from OM_2 while the minimum (7.95 cm) was observed in OM_0 . Poultry manure increased the knob diameter since it is rich in its nitrogen and nutrients content. Combined effect of variety and organic manures had a significant

influence on knob diameter of kohlrabi plant (Table 4). The maximum diameter (10.17 cm) was recorded from White Vienna with poultry manure (OM_2V_3) and the minimum knob diameter (5.26 cm) was observed from Early 0058 with control treatment (OM_0V_5).

3.1.7. Knob weight

Knob weight is important for increasing total yield. Knob weight was significantly influenced on different kohlrabi cultivars (Table 1). The maximum knob weight (366.60 g) was recorded from White Vienna (V_3) and the minimum weight (88.20 g) was observed in Early0058 (V_5). Application of different organic manures exhibited a significant influence on Knob weight of kohlrabi plants (Table.2). Knob weight ranged from 177.50 g to 366.60 g. The maximum knob weight (366.60 g) was recorded from OM_2 , which was statistically similar to that of OM_3 while the minimum (177.50 g) was observed in OM_0 . It was revealed that knob weight increased in poultry manure. This might due to presence of high amount of nitrogen

Table 4: Combined effect of varieties and organic manures on diameter of knob, knob weight and yield ha^{-1} on kohlrabi plants

Treatments	Diameter of knob (cm)	Knob weight (g)	Yield (t ha^{-1})
OM_0V_1	6.00 ^{ij}	100.70 ⁱ	7.46 ^g
OM_1V_1	6.73 ^{gh}	205.30 ^{fg}	15.5 ^f
OM_2V_1	8.93 ^{ab}	253.00 ^{de}	18.83 ^{ef}
OM_3V_1	8.56 ^{ab}	378.70 ^b	28.05 ^b
OM_0V_2	6.5 ^{hi}	114.30 ^{hi}	8.43 ^g
OM_1V_2	8.46 ^{ab}	244.30 ^{ef}	18.10 ^{ef}
OM_2V_2	9.73 ^{ab}	271.00 ^{de}	20.07 ^{de}
OM_3V_2	9.06 ^{ab}	234.70 ^{ef}	19.83 ^{de}
OM_0V_3	6.93 ^{fg}	116.50 ^{hi}	8.62 ^g
OM_1V_3	7.33 ^{de}	203.00 ^{fg}	15.21 ^f
OM_2V_3	10.17 ^a	442.70 ^a	32.78 ^a
OM_3V_3	7.76 ^{cd}	273.30 ^{de}	20.27 ^{de}
OM_0V_4	6.43 ^{hi}	170.30 ^{gh}	10.50 ^g
OM_1V_4	7.20 ^{ef}	281.30 ^{de}	19.83 ^{de}
OM_2V_4	9.26 ^{ab}	406.70 ^{ab}	30.11 ^{ab}
OM_3V_4	8.36 ^{bc}	397.70 ^{ab}	29.43 ^{ab}
OM_0V_5	5.26 ^j	89.00 ⁱ	7.60 ^g
OM_1V_5	9.06 ^{ab}	315.00 ^{cd}	23.30 ^{cd}
OM_2V_5	8.86 ^{ab}	350.70 ^{bc}	25.97 ^{bc}
OM_3V_5	9.03 ^{ab}	367.70 ^{bc}	27.23 ^{bc}
LSD ($p=0.05$)	1.525	58.38	3.864
CV(%)	13.10	12.20	11.68

contents in poultry manure which enhance photosynthesis, cell division and cell enlargement. Similar trend of the results were found by scientists like Balyan et al. (1988); Sharma et al. (2002), Singh (2004); Reddy and Padmaja (2005).

Combined effect of variety and organic manures had a significant influence on knob weight of kohlrabi plant (Table 4). The maximum knob weight (442.70 g) was recorded from White Vienna with poultry manure (OM_2V_3) and the minimum knob diameter (89.00 g) was observed from Early0058 with control treatment (OM_0V_5).

3.1.8. Yield ha^{-1}

Cultivars had a significant influence on yield ha^{-1} of kohlrabi plants (Figure 1). The maximum yield (27.14 t) was recorded from White Vienna (V_3) and the minimum yield (5.8 t) was observed in Early 0058 (V_5). Application of different organic manures exhibited a significant influence on yield ha^{-1} of kohlrabi plants (Figure 2). Yield ha^{-1} of kohlrabi plants ranged from

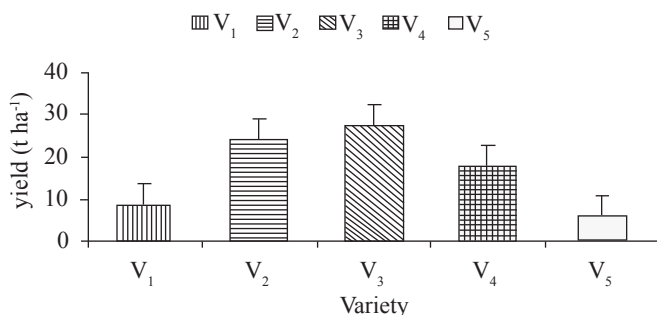


Figure 1: Effect of different variety on yield of kohlrabi

15.40 t to 22.90 t. The maximum yield (22.90 t) was recorded from poultry manure (OM_2) which was statistically similar to that of vermicompost (OM_3) while the minimum yield (15.40 t) was observed in control (OM_0). The increase in the total yield resulted by organic manuring may be attributed to the fact that organic manuring enhanced soil aggregation, soil aeration, increased water holding capacity and offers good environmental conditions for the root system of kohlrabi plants. Poultry manure is rich in its nitrogen and nutrients content. These favorable conditions creates better nutrients absorption and favors the growth and development of root system which in true reflects better vegetative growth, photosynthetic activity. Consequently higher total yield might have been obtained by poultry manure. Similar reports were recorded by other investigators such as Abou El-Magd et al. (2006). Combined effect of variety and organic manures had a significant influence on yield ha^{-1} of kohlrabi plant (Table 4). The maximum yield (32.78 t) was recorded from White Vienna with poultry manure (OM_2V_3) and the minimum yield (7.46 t) was observed from

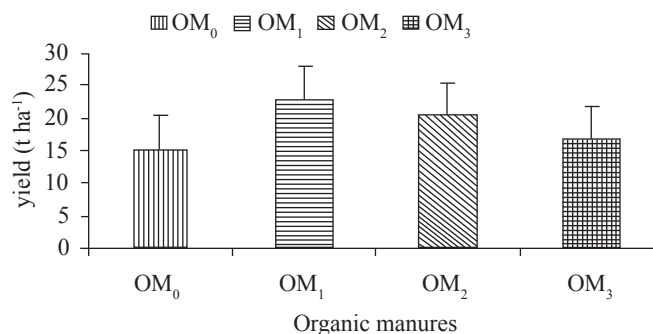


Figure 2: Effect of organic manures on yield of kohlrabi

Quick star with control treatment (OM_0V_1).

4. Conclusion

In a single effect, White Vienna proved best variety and poultry manure resulted highest growth and yielding ability. Both of these combinations also recorded highest performance.

5. References

- Abou El-Magd, M.M., Hoda, A.M., Fawzy, Z.F., 2005. Relationship growth, yield of broccoli with increasing N, P or K ratio in a mixture of NPK fertilizers (Brassica oleracea var italica plenck). *Annals of Agriculture Science* 43(2), 791-805.
- Abou El-Magd, M.M., Hoda, A., Mohamed, Fawzy, Z.F., 2006. Effect of organic manures with or without chemical fertilizers on growth, yield and quality of some varieties of broccoli plants. *Journal of Applied Sciences Research* 2(10), 791-798.
- Beecher, C., 1994. Cancer preventive properties of varieties of Brassica oleracea: a review. *The American Journal of Clinical Nutrition* 59, 1166-1170.
- Balyan, D.S., Dhankar, B.S., Rahul, D.S., Singh, K.P., 1988. Growth and yield of cawiflower variety, Snowball-16 as influenced by nitrogen, phosphorus and zinc. *Haryana Journal of Horticultural Sciences* 17(3-4), 247-254.
- FAO. 1988. The Year Book of production. FAO, Rome, Italy.
- Gomez, K.A., Gomez, A.A., 1984. Statistical procedures for Agricultural Research. 2nd Edition. Wiley Inter Science Publication, 357-423.
- Reddy, A.R., Padmaja, G., 2005. Effect of phosphorus and zinc on curd yield and quality of cauliflower. *Journal of Research ANGRAU* 33(1), 65-98.
- Sharma, S.K., Sharma, R., Korla, B.N., 2002. Effect of nitrogen and phosphorus on the growth and seed yield of sprouting broccoli cv. Green Head. *Horticultural Journal* 15(2), 87-90.
- Singh, A.K., 2004. Effect of nitrogen and phosphorus on growth and curd yield of cauliflower var. snowball -16 under cold arid region of Ladakh. *Haryana Journal of Horticultural Sciences* 33(1&2), 127-129.