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Effect of organic manure and inorganic fertilizers on growth and yield of knol-khol (*Brassica oleracea* var. *caulorapa* L.)

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Abstract

The present investigation was conducted to study the effect of organic manure (farmyard manure and vermicompost) and inorganic fertilizer (NPS) on growth and yield of knol-khol at Horticulture Research farm of SKNCOA, Jobner. The experiment consisted of five levels of organic manure and four levels of inorganic fertilizer including control. Among organic manures higher level of vermicompost (5t ha^{-1}) and among inorganic fertilizer 100% recommended dose of NPS resulted in maximum increase in growth attributes(plant height at harvest, diameter of knob, volume of knob, chlorophyll content, days taken to initiation and maturity of knob), total yield(226.33 qha^{-1}) and yield attributes (fresh weight of knob/plant and knob yield/plot).The results show interactive effect of organic manure and inorganic fertilizer on fresh weight of knob/plant and total yield.

KEY WORDS: Knol-khol, Organic manure, Inorganic fertilizer, growth, yield.

Introdutuion

Knol-khol (*Brassica oleracea* var. *caulorapa*) is a winter season vegetable crop grown for its knob which arises from thickening of the stem above the cotyledon. Its acreage is very limited but liked in Kashmir and Karnataka region and as a minor vegetable in West Bengal, UP and HP. Its high nutritional value makes it ideal for maintaining optimum health. It is a good source of vitamin A(361 IU), calories(25 cal), protein(1.1g), carbohydrates(3.8g), fibre(1.5g) and minerals like phosphorous(35mg), calcium(24mg) and iron(0.4mg) per 100g of edible portion.(Bose,2001).

Application of organic manure like farmyard manure and vermicompost in combination with N, P and S have been reported to reduce bulk density, improve soil porosity and increasing water holding capacity .(Mahaswarappa *et al*,1999). Use of organic manure along with chemical fertilizer improves the soil physical, chemical and biological properties that play an important role in maintaining soil fertility. Increasing concern for the environment and emerging trend towards organic farming have driven the search for effective and ecofriendly alternatives in crop production. Authentic information of organic cultivation aspects of knol-khol is not available as it is a minor crop. In this context, the present study was carried out to investigate the effect of organic manures including farmyard manure and vermicompost and inorganic fertilizer including N, P and S on growth and yield of knol-khol.

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Material and Methods

A field experiment was conducted at Horticulture farm, Department of Horticulture ,S.K.N. College of Agriculture, Jobner, Jaipur during *rabi* season, 2011-12 in the period from October to January. The climate of the region is typically semi arid with average rainfall of 300mm. The experiment was laid out in randomized block design with three replications. The experiment comprised of 20 treatment combinations. The treatment of organic manure consist of five levels (control,10tha^{-1} FYM, 20tha^{-1} FYM, 2.5tha^{-1} VC and 5tha^{-1} VC) and inorganic fertilizer consist of four levels (control, 50%,75% and 100% of RD of NPS). The experimental field was sandy loam in texture and alkaline in nature having ph 8.2. Water of this area is saline in nature and the irrigation water falls under C_4S_2. FYM and vermicompost were applied in their respective quantity before transplanting the seedlings to the main field. Nitrogen was applied through DAP and urea in two equal splits, phosphorous through DAP and sulfur in elemental form as basal dose only.

Results and Discussion

The data pertaining to the effect of different organic manures and fertility levels on different growth attributes, yield and yield attributes were analyzed statistically and results of all the main effects and significant interaction have been presented.

Effect of organic manures

Growth attributes

Application of higher level of vermicompost (5t ha^{-1}) increased growth parameters, plant height at harvest (30.05cm), diameter of knob (7.80cm), volume of knob (114.00cc), chlorophyll content (0.74mg/g), days taken to initiation (33.06) and complete maturity (58.18) of knob. Parameters were found to be significantly higher than control, 10t ha^{-1} FYM and 2.5t ha^{-1} VC but was found at par with 20t ha^{-1}FYM except days taken to initiation was found significantly higher. Plant height at 30 DAS and leaf area was found non significant. This enhancement may be due to better moisture holding capacity, supply of micronutrients and availability of major nutrients in soil due to favorable conditions created by vermicompost. (Reddy *et al*. 1998 and Kumhar *et al*. 2004). Ishfaq *et al*.(2009) found tallest plant with highest level of vermicompost (10t ha^{-1}) among three levels (0,5 and 10t ha^{-1}) in cabbage.

Yield attributes and yield

Parameters like fresh weight of knob/plant, knob yield/plot and total yield were found 134.21g, 2.91kg and 226.33q ha^{-1}, respectively and were significantly higher for 5t ha^{-1} VC than other treatments but at par with 20t ha^{-1} FYM. Vermicompost might have increased the efficiency of added chemical fertilizers in the soil, activity of nitrogen fixing bacteria and its increased rate of humification enhances both native and added nutrient resulting in increment yield attributing character. (Sreeniwas *et al*., 2000). Sharma *et al*. (2011) found maximum yield with full dose of FYM and vermicompost on knol-khol.

Effect of inorganic fertilizer

Growth attributes

Parameters like plant height at harvest (29.90cm), diameter of knob (7.5cm), volume of knob (115.69cc), chlorophyll content (0.72mg/g), days taken to initiation (32.55) and complete maturity (56.21) of knob were observed significantly higher with 100% of recommended dose of NPS as compared with control and 50% level where as 75% level was found at par and non significant result was found in plant height at 30 DAS and leaf area index. These results are in close conformity with the findings of Choudhary (2006). Kachri and Korla (2009) recorded different aspects of cauliflower and found best results with 100% P + recommended dose of N and K.

Yield attributes and yield

Significantly higher fresh weight of knob/plant (135.05g), knob yield/plant (2.83kg) and total yield (250.15 q ha^{-1}) was recorded with 100% of recommended dose of NPS than control and 50% level, but at par with 75% level. Application of 100% recommended dose of NPS favour the auxin and metabolic activities in plant which ultimately result in increased weight of knob and total yield ha^{-1}. (Everaarts and Boou.2000, Kumhar.2004). Zhang *et al*.,(2007) also reported maximum yield (13592.2 kg ha^{-1}) with optimal combination of N, P and K on broccoli.

Interactive effect (M × F)

Significant result was found in interaction of different organic manures and fertility levels in fresh weight of knob/plant (164.55g) and total yield (285.97q ha^{-1}) with 5t ha^{-1} vermicompost and 100% recommend

Table 1 : Effect of organic manure and inorganic fertilizer on growth and yield attributes of knol-kho

Treatments	Plant height at harvest (cm)	Diameter of knob (cm)	Volume of knob (cc)	Chlorophyll content (mg/g)	Days taken to initiation of knob	Days taken to complete maturity	Fresh weight of knob/plant (g)	Knob yield/ plot (kg)	Total yield (qha^{-1})
Organic manure					29.20				
M_0-Control	26.75	6.40	106.00	0.63	30.00	50.95	74.45	2.03	130.92
M_1-FYM 10t ha^{-1}	28.05	6.69	107.00	0.65	31.50	52.20	99.01	2.33	199.08
M_2-FYM 20t ha^{-1}	29.69	7.65	112.24	0.72	30.72	55.10	131.01	2.80	222.48
M_3-VC 2.5t ha^{-1}	28.35	6.80	108.00	0.68	33.06	53.20	112.05	2.43	211.06
M_4-VC 5.0t ha^{-1}	30.05	7.80	114.00	0.74	0.52	58.18	134.21	2.91	226.33
SEm±	0.57	0.16	1.98	0.01	1.48	0.77	2.35	0.05	4.33
CD at (p=0.05)	1.64	0.47	5.68	0.04		2.20	6.74	0.14	12.39
Fertility levels					29.22				
F_0-Control	26.75	6.58	102.21	0.65	30.40	51.99	73.08	2.05	111.95
F_1-50% of RD	28.20	7.03	107.32	0.67	31.43	53.48	102.44	2.35	189.20
F_2-75% of RD	29.48	7.10	112.56	0.70	32.55	54.02	130.01	2.77	240.60
F_3-100% of RD	29.90	7.50	115.69	0.72	0.46	56.21	135.05	2.83	250.15
SEm±	0.51	0.15	1.77	0.01	1.32	0.69	2.11	0.04	3.87
CD at (p=0.05)	1.46	0.42	5.07	0.03		1.97	6.03	0.13	11.09

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