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Influence of organic, inorganic fertilizers and micronutrients on growth of broccoli

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Abstract

An investigation was carried out during years (2015-16) at experimental farm of Department of Applied Plant Science (horticulture) Babasaheb Bhimrao Ambedkar University, Lucknow India. To find out the Influence of organic inorganic fertilizers and micronutrient on growth of broccoli. Twelve treatments including control were used and each treatment was replicated thrice. Growth and yield component was highest under the treatment T₁₀- Recommended Dose of Fertilizer (RDF) in which second top dressing dose of N in urea was replaced by UVM-1, as compared to other treatments. The maximum plant height (31.82 cm and 44.30 cm) and minimum (24.43 cm and 4035 cm) 30 and 60 days respectively. The maximum number of leaves per plant (8.21 and 15.80) and minimum (7.25 and 13.11) 30 and 60 days respectively. The minimum day of curd initiation 63.65 and maximum 66.29, maximum weight of curd with guard leaf 418.33 gram and minimum 289.74 gram, maximum weight of curd without guard leaf 553.21 gram and minimum 338.37 gram, maximum curd diameter, 15.63 and minimum 13.46, maximum yield kg/plot 3.18 and minimum 2.14 and maximum yield q/ha 224.33 and minimum 151.40 under treatment T₁₀ and minimum yield quality of broccoli days 30 and 60 DAT under treatment T₀. Whereas, which second top dress dose of N in urea from replaced through UVM-1 followed by under treatment T₁₁ which total dose of N in urea form replaced through UVM-1 which total dose of N in urea form replaced through UVM-1 and maximum curd initiation days 30 and 60 DAT (66.29 days) under treatment T₀.

Keywords: Growth parameters, organic, inorganic fertilizers growth and yield etc.

Introduction

Broccoli (*Brassica oleracea* L. var. *italica*) is a member of the brassicaceae family as a wild form of this family, which found along the Mediterranean region Decoteau (2000) [4]. Broccoli is an Italian vegetable, native to the Mediterranean region, cultivated in Italy in ancient roman times and about 1720 in England. On the other hand, the USA it first appeared in 1806, but it was commercially cultivated of broccoli was started around 1923 Decoteau (2000) [4]. The word Broccoli originated from Broccoli is to some extent sensitive to temperature, and the optimal range for vegetative growth is not the same as for inflorescence development. Broccoli is an important health food as it has been found to be anti-carcinogenic and antioxidant. Carotene present in high quantities in broccoli improves eyesight and prevents cataracts. 100g of broccoli yields just about 34 calories, which is good for health and diet conscious Ravi. (2015) [11]. Growing broccoli in the newly reclaimed soils is faced by various problems, such as cultivars, fertilization, low amounts of available nutrients and low organic matter content as well as poor hydrophilic, chemical and biological properties. Found that using mineral fertilizer (N, P and K) increasing broccoli vegetative growth and yield. The consumption of broccoli in daily diet, it minimizes the incidence of various types of cancer disease in human beings. It has some cancer fighting substances like Phytochemicals, β-carotenes, Indoles and isothiocyanates. It also contains sulforaphane; it checks the growth of tumors and reduces the risk of cancer.

Essential micronutrients play an important role in physiology of the broccoli crop. The beneficial effect of fertilizer addition including organic matter containing mineral nutrients to soil for improved growth of plant. Balanced fertilizers through organic and inorganic sources improve the soil health as well as boost the productivity of broccoli. Macro nutrients play an important role in growth and development process of the plant such as nitrogen encourages vegetative growth and phosphorus encourages root development and also providing energy by forming ATP and potassium play an important for carbohydrate metabolism, enzyme activation and osmotic regulation Shaheen *et al.* (2007) [15]. The application of Zn and manganese fertilizers profound various metabolic processes, within the plant system and there by influence the yield potential Trippathy *et al.* (1999) [19]. The objective is effect of organic, inorganic fertilizers and micronutrients on morphological characters and growth and yield component of broccoli.

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Materials and Methods

Present experiment was carried out at Horticulture Research Farm of Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India during Rabi season of 2015-16. The seedlings of broccoli cv. Pusa KTS- 1 were prepared in the nursery and planted in the main field at 45×35 cm spacing. Experiment was laid out in Randomized Block Design. The different parameters were studied at 30 and 60 DAP (Days after Planting). There were twelve treatment combinations which included various combinations of organic, inorganic fertilizers and micronutrients *i.e.*, T₀-Control, T₁- Recommended dose of fertilizer (RDF) (100% NPK), T₂-Fertilizer product OPV-1 equal to P in T₁ rest as urea, MOP.(RDF, OPV-1), T₃- Fertilizer product OPV-2 equal to P in rest urea MOP. (RDF, OPV-2), T₄ RDF + 500 kg/ha silicon, T₅- RDF + 1000 kg/ha OSV-1, T₆- RDF + 500 kg/ha OSV-2, T₇- RDF + 1000 kg/ha, T₈-RDF in which basal dose of N in urea form was replaced through UVM-1, T₉- RDF in which first top dress dose of N in urea form was replaced through UVM-1, T₁₀- RDF in which second top dress dose of N in urea form was replaced through UVM-1, T₁₁- RDF in which total dose of N in urea form was replaced through UVM-1.

Results and Discussion

The perusal of data present in table 1 and clearly reflect that fertilizers application caused significant increase in the maximum plant height (32.54 and 45.67 cm) was recorded with treatment (T₁₀) 30 and 60 DAT, respectively and it was

followed by T₆ (31.82 cm) at 30 DAT and T₈ (44.30) at 60 DAT whereas minimum plant height was measured with T₀ (24.43 and 40.35 cm). The addition of micronutrient to increase the uptake of NPK and promotion of cell elongation and cell division which increased plant height Shukla *et al.* (1997) [16]. The finding is in accordance with the report of Singh *et al.* (2010) [17] in cauliflower cultivar cv. in cv. KCMC-1. Treatment T₁₀ resulted maximum number of leaves per plant (8.21 and 15.80 cm) at 30 and 60 DAT followed by T₂ (7.87 and 15.47 cm) at 30 and 60 DAT respectively. While, minimum number of leaf is recorded in T₀ (7.25 and 13.11 cm) at 30 and 60 DAT. Maximum leaf of length (26.57 cm and 39.22 cm) was recorded with T₁₀ 30 and 60 DAT, respectively and it was followed by T₁₁ (26.50) at 30 DAT and T₇ (38.74) at 60 DAT. whereas minimum length of length of leaf was measured with T₀ (23.54 and 35.36). Treatment T₁₀ resulted maximum width of leaf (14.52 cm and 26.35 cm) at 30 and 60 DAT followed by T₈ (25.79 cm) at 30 DAT and T₃ (25.79) DAT while, minimum width of leaf is recorded with T₀ (12.77 and 23.44 cm) at 30 and 60 DAT, respectively. The application combine nutrients (B, Zn, Mo, Cu, Fe, Mn) at 0.1% also increased the number of eaves in cauliflower cv. KCMC-1 (Singh *et al.*, 2010). Maximum stem diameter (1.93 and 4.14 cm) was recorded with T₁₀ 30 and 60 DAT, respectively and it was followed by T₂ (1.81 cm) at 30 DAT and T₆ (3.83cm) at 60 DAT where, minimum stem diameter was measured with T₀ (1.58 and 2.87 cm). These result corroborated with the findings of (Buragohain and Gogoi. 2007) [2] and (Singh *et al.* 2015) [17].

Table 1: Influence of organic, inorganic fertilizers and micronutrients on growth of broccoli.

Treatments	Plant height (cm)		Number of leaves		Length of leaf (cm)		Width of leaf (cm)		Stem diameter (cm)	
	30DAT	60DAT	30DAT	60 DAT	30DAT	60DAT	30DAT	60DAT	30DAT	60DAT
T ₀	24.43	40.35	7.25	13.11	23.54	35.36	12.77	23.44	1.58	2.87
T ₁	25.79	41.26	7.82	14.18	24.54	36.80	13.11	24.04	1.77	3.35
T ₂	24.68	41.51	7.87	15.47	24.31	38.17	13.18	25.58	1.81	3.61
T ₃	26.56	43.22	7.55	15.28	24.02	36.55	12.91	25.79	1.68	3.34
T ₄	28.27	44.59	7.83	13.88	23.38	37.96	13.51	25.31	1.61	3.32
T ₅	30.55	44.22	7.67	13.77	23.72	37.62	13.22	25.10	1.69	3.10
T ₆	30.99	44.88	7.82	14.93	24.84	37.54	13.19	25.66	1.80	3.83
T ₇	29.90	43.56	7.77	15.09	25.02	38.74	13.46	25.15	1.82	3.63
T ₈	30.14	45.33	7.60	14.93	25.61	37.60	13.81	25.55	1.73	3.68
T ₉	29.73	42.78	7.83	15.20	24.25	37.59	13.11	24.66	1.66	3.56
T ₁₀	32.54	45.67	8.21	15.80	26.57	39.22	14.52	26.35	1.93	4.14
T ₁₁	31.82	44.30	7.82	14.39	26.50	38.43	13.21	23.25	1.73	2.92
C.D (p=0.05)	2.85	7.23	1.05	1.44	2.79	3.02	1.42	1.61	0.30	0.58

The perusal of data present in table 2 and clearly reflect that fertilizers application caused significant increase treatment T₉ resulted minimum duration to curd initiation (61.16 days) followed by T₁₀ (62.69 days) while, maximum days to curd initiation was recorded with T₀ (66.29 days.) Maximum weight of curd with gourd leaf (418.33 g) was recorded under the treatment T₁₀ and it was followed by T₇ 368.29. Whereas, minimum weight of curd with gourd leaf (289.74) measured with T₀. Treatment T₁₀ resulted maximum weight of curd with guard (353.21 g) followed by T₇ (324.24 g) while, minimum weight of curd with guard as recorded with T₀ (238.37 g). It may be positive marked effect of micro nutrient on the parameter with stimulating effect of this nutrient on root growth and nutrient up take. This conformity with the finding of Abd-El Samad *et al.* (2011) [1] in onion. Enhanced nutrient uptake because of application of organic phosphorus. The finding is in accordance with Zafar *et al.* (2011) [21] in common bean and Yassen *et al.* (2010) [20] in wheat Photosynthetic, play important role to production of biomass

and increase total yield of the broccoli. Therefore it is hypothesised that higher nutrient status in leaves have improved the CO₂ exchange rate resulting in increased photosynthesis and yield Natrajn *et al.* (1972) [12]. Maximum diameter of curd (15.63 cm) was recorded with T₁₀ and it was followed by T₆ (15.66 cm). Whereas minimum diameter of curd was measured with T₀ (13.46 cm). These results are agreement with the finding of kanujia *et al.* (2006) [8] in cabbage with observed maximum curd diameter in cabbage application of micronutrients and (Singh *et al.* 2010) in cauliflower. Treatment T₁₀ resulted maximum yield (3.18 kg) followed by T₈ (2.82 kg) while minimum yield per plot was recorded with T₀ (2.14 kg). Maximum yield (224.34 q/ha) was recorded with T₁₀ and it was followed by T₇ 205.93. Whereas, minimum yield was recorded with T₀ (151.40). These results are in accordance with the findings of Sawan *et al.* (1989) [13] in cotton, Ahmadi (2010) [1] in oilseed rape Singh *et al.* (2010) [17] in cauliflower.

Table 2: Influence of organic, inorganic fertilizers and micronutrients on yield of broccoli.

Treatments	Curd initiation days	Weight of curd with guard leaf	Weight of curd without	Diameter of the curd (cm)	Yield (Kg/plot)	Yield (q/ha).
T ₀	66.29	289.74	238.37	13.46	2.14	151.40
T ₁	65.33	361.07	310.67	15.36	2.79	197.31
T ₂	63.74	329.66	278.00	14.48	2.50	176.57
T ₃	66.05	307.00	252.00	14.94	2.26	160.05
T ₄	64.01	326.33	270.67	15.20	2.43	171.91
T ₅	63.51	332.33	259.00	15.33	2.33	164.50
T ₆	64.82	361.33	301.66	15.66	2.71	191.60
T ₇	65.79	368.29	324.24	14.75	2.92	205.93
T ₈	62.81	364.00	313.33	15.40	2.82	199.01
T ₉	61.16	347.00	292.33	15.38	2.63	185.67
T ₁₀	62.69	418.33	353.21	15.63	3.18	224.34
T ₁₁	63.65	319.00	282.77	15.22	2.54	179.60
CD (P=0.05)	3.50	55.67	46.65	1.40	0.42	26.63

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