

Effect of Integrated Nutrient Management on Yield attributes and Yield of Broccoli (*Brassica oleracea* var. *italica*) under Mid-Hills condition of Uttarakhand

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ABSTRACT

A field experiment was conducted in mid hills of Uttarakhand to evaluate the effect of integrated nutrient management on yield attributes and yield of broccoli (*Brassica oleracea* var. *italica*) at Vegetable Research and Demonstration Block, College of Horticulture, VCSG, Uttarakhand University of Horticulture and Forestry, Bharsar, Uttarakhand in the year 2019. Total 10 different treatment combinations were taken which includes organic manure, inorganic fertilizer and combination of organic and inorganic fertilizer. The crop of broccoli cv. Palam Samridhi was transplanted at a spacing of 50cm × 45cm. The result revealed that yield attributes like head width, gross head weight, net head weight, stalk length and yield was recorded highest with the application of 50% RDF + 50% vermicompost emphasizing the beneficial effect of integrated nutrient management on broccoli production.

Key words : Integrated nutrient management, Broccoli, Yield

Introduction

Broccoli (*Brassica oleracea* var. *italica*) belongs to the brassicaceae family. It is a native of the eastern Mediterranean and Asia Minor (Thamburaj and Singh, 2001). Broccoli is an English name, which is derived from the Italian word "*broccolo*" which means "the flowering crest of a cabbage," and the Latin word "*brachium*" which means arm, branch or shoot. The main broccoli producing countries are India, China, Italy and France (Dixon, 2007). In recent time sprouting broccoli is gaining popularity in India due to increasing demand in cosmopolitan cities and awareness of its high nutritive values.

Broccoli is the cool season crop and grows best

when exposed to an average daily temperature between 18-23°C. The plants are not injured by light frost. Broccoli is a fast-growing annual plant that grows 60–90cm (24–35 inches) tall. Upright and branching with leathery leaf, broccoli bears dense green clusters of flower buds at the ends of the central axis and the branches. If left unharvested, those buds bear yellow flowers with four petals and produce siliqua fruits (a dry capsule). The heads or florets reach harvesting stage at 60 to 150 days after sowing, depending upon the variety and the weather.

According to the USDA (United States Department of Agriculture) National Nutrient Database, one cup of chopped raw broccoli contains about 6

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gram of carbohydrates, 3 gram of protein, 0.4 gram of fats and some of the vitamins and minerals. Broccoli is rich in phytochemicals indole-carbinol and sulphoraphane. Indole-carbinol causes the estrogen breakdown, a hormone that seems to stimulate the development of some types of mammary tumors. Sulphoraphane increases the activity of the protective enzymes against cancer. Although broccoli have got huge domestic requirement, a number of limiting factors such as biotic and abiotic factors have been attributed for low productivity (Chaudhary, 2009).

Being a newly introduced crop of Uttarakhand, there is an urgent need to adopt an integrated nutrient management system for promoting efficient and balanced use of plant nutrients. To decrease the use of fertilizers an effective implementation should be introduced to improve the agriculture practices. The challenges for agriculture over the coming decades will be to meet the world's increasing demand for food in a sustainable way therefore, there is an urgent need to adopt an integrated nutrient supply and management system for promoting efficient and balanced use of plant nutrients for increasing production without deteriorating the health of the soil. Integrated nutrient management is a balanced use of inorganic fertilizers, organic manures, crop residues and biofertilizers in combination to maintain the desired crop production along with maintenance of soil health (Hazra, 2007).

Materials and Methods

The study was carried out at Vegetable Research and Demonstration Block, College of Horticulture,

Uttarakhand University of Horticulture and Forestry, Bharsar, Uttarakhand during the year of 2019. The seed of the cultivar was sown in the well prepared nursery bed in lines and covered with a layer of soil and farmyard manure mixture. Regular watering was done in nursery to maintain moisture for the proper growth and development of seedlings. Nursery was kept free from weeds. Timely plant protection measures were also followed to prevent nursery from damping off and other diseases. In broccoli there is incidence of damping off which was controlled by spraying bavistin. The seedling of broccoli was transplanted in March, 2020 at a spacing of 50 cm × 45 cm. The plants were spot watered for a week, and later on, light flood irrigation was given. Hoeing and weeding were carried out as per recommended for the respective crops. Irrigation was given as per requirement. Harvesting was done at full maturity stage.

Result

The result obtained on yield attributes and yield is shown in Table 1.

Yield attributes

Based on the data it was revealed that yield attributes of broccoli like head width, gross head weight, net head weight and stalk length was recorded highest with the integrated application of 50% RDF+ 50% Vermicompost.

Yield

The yield of broccoli was significantly influenced by different treatments as shown in Table 1. The maxi-

Table 1. Effect of INM on yield attributes of Broccoli (*Brassica oleracea var. italica*)

Treatment	Head Width (cm)	Gross Head Weight (g)	Net Head Weight (g)	Stalk Length (cm)	Yield (Q ha ⁻¹)
Control	5.82±0.30	119.10±0.29	99.30±2.61	6.66±0.16	27.28±0.71
Full dose of RDF	7.76±0.32	179.86±1.56	137.25±15.10	7.66±0.13	37.70±4.14
100% FYM	8.22±0.11	180.02±10.39	134.39±7.85	8.60±0.41	36.78±2.09
50% RDF + 50% FYM	8.91±0.08	209.06±39.29	161.51±9.69	8.86±0.06	44.20±2.57
100% Mustard cake	10.05±0.06	297.19±20.71	172.87±4.11	9.46±0.53	47.31±1.08
50%RDF+ 50% Mustard cake	9.70±0.05	279.12±19.87	168.68±9.27	8.60±0.17	46.18±2.58
100% Vermicompost	10.40±0.07	330.53±5.68	180.62±6.32	9.26±0.30	49.45±1.75
50%RDF+50%Vermicompost	11.18±0.15	377.99±14.55	192.60±3.83	10.73±0.13	52.72±1.10
100%Poultry manure	9.84±0.24	358.64±23.52	182.62±2.98	8.86±0.37	49.98±0.75
50%RDF+50%Poultrymanure	10.79±0.19	354.93±27.86	189.88±3.07	9.20±0.20	51.96±0.78
C.D.at5%	0.58	56.38	21.38	0.83	5.91
S.E. (d)	0.28	26.63	10.09	0.39	2.79

mum head yield was recorded with application of 50% RDF + 50% vermicompost. On the other hand, the lowest head yield was obtained in control. These results indicated that yields can be enhanced with the application of organic manure along with inorganic fertilization.

Discussion

From the result it can be known that integrated application of inorganic and organic nutrient provided synergistic effect on yield attributes of broccoli crop which enhances the ultimate yield of the crop.

Conclusion

Thus, from the study it can be concluded that integrated application of nutrient can result in gaining maximum yield attributes and yield in broccoli *cv.*

Palam Samridhi under mid hill condition of Uttarakhand.

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