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Ahmad Hussain Rasikh
 Agriculture Faculty, Bamyan
 University, Bamyan Province-
 Afghanistan

Standardization of fertilizers and its effect on growth and yield of cauliflower (*Brassica oleracea*) under Bamyan condition

Ahmad Hussain Rasikh

Abstract

The current study was conducted on the effect of different dose of NP fertilizer on cauliflower in Fuladi valley of Bamyan during the year 2017. The objective of the study was to know the optimum dose of fertilizer, namely NP in cauliflower. The experiment had three levels of NP fertilizer T₂ (50%), T₃ (75%), T₄ (100%) and T₁ (zero NP) based on recommended dose of NP. The result showed that the highest plant height (45.66 cm) was observed at T₂ (50% NP) followed by (44.33 cm) at T₄ (100% NP) and the lowest plant height was (36.33 cm) recorded at T₁ (control treatment), maximum plant spread (68.66 cm) was recorded at T₄ (100% NP) fertilizer followed by (66.66 cm) at T₂ (50% NP) recommended fertilizer dose and minimum plant spread (58.33 cm) was recorded at T₁ (control treatment) and the observation which was recorded at 20th July the maximum No. of leaves/plant (19.33 leave/plant) were observed at T₃ (75% NP) followed by (18 leave/plant) with T₂ (50% NP) and (16 leave/plant) with T₄ (100% NP) application, while the minimum number of leaves/plant was obtained (15.66 leave/plant) at T₁ (control treatment). The highest yield (46.2 m ton/ha) was recorded at T₄ (100% NP) followed by (44.2 m ton/ha) at T₃ (75% NP) and lowest yield (28.6 m ton/ha) obtained in control treatment. This might be due to nutrient availability by applying different level of chemical fertilizer. The study concluded that application of 100% of NP might be useful under Bamyan condition.

Keywords: Fertilizer, cauliflower, Bamyan condition

Introduction

Cole crops are including cauliflower, cabbage, broccoli, radish, turnip. Cauliflower (*Brassica oleracea*) is one of several vegetables in the family of *Brassicaceae*. It is an annual plant that reproduces by seed. (Malik, 1994) [4]. Cauliflower has a long history, the oldest record of cauliflower dates back to the 6th century B.C. In the 2nd century, Pliny included what he called *cyma* among his descriptions of cultivated plants in Natural History. The area under cauliflower in the world was 7.73 lakh hectares and production 138.42 lakh tones in the 1999-2000 (Swarup, 2006) [5]. The cauliflower is one of the important vegetable crops which are thought to be suitable for growing under Bamyan climate condition. Moreover, local market is available for cauliflower both in Bamyan and at the national level. Currently cauliflower is imported to Bamyan from other parts of Afghanistan.

Based on the decision of technical committee and expert's team of agriculture, we decided to investigate the standardization of fertilizers and its effect on growth and yield of cauliflower under Bamyan condition. As it can help the farmers to diversify their income and meet the necessity of market in Bamyan and whole Afghanistan. Cauliflower is one of Cole crop vegetables, which is rich in minerals, vitamin A and C and Fiber (Chintamani, 2008) [1]. In addition, it helps to enrich the food basket of Bamyan farmers need to have alternative cropping as they can't grow potato every year. In addition, they need to grow some crops which generate more income as compared to potato as well as meet the requirement of the local market.

Materials and Methods

A field experiment was carried out using different level of fertilizer on cauliflower (*Brassica oleracea*) with four treatments and three replications at Fuladi valley, Bamyan. There were three levels of NP fertilizer T₂ (50%), T₃ (75%), T₄ (100%) and T₁ (received zero NP) based on recommended dose of NP. The land was prepared by traditional method at two stages. Firstly, the land was ploughed by animal and then ploughed by the help of men power using

Correspondence
 Ahmad Hussain Rasikh
 Agriculture Faculty, Bamyan
 University, Bamyan Province-
 Afghanistan

shovel. Secondly, animal fertilizer also was applied before the seedling was cultivated in the field on 11 April 2017. The study was carried out in completely randomized block design (RCBD) layout.

Sowing and Cultivation Method

The seedling of cauliflower was planted in a range of 50 cm distance between plants and 50 cm between rows. The seedling was planted by hand using 50 cm stick for measuring of spacing between the seedlings of cauliflower. The distance between plants and rows kept uniformly as mentioned above.

Irrigation and application of fertilizer

The trail was irrigated 17 times during the crop growing season and the irrigation was stopped 6 days ahead of harvesting. Three different rates of nitrogen fertilizers were applied in the form of urea and phosphorus fertilizer in the form Diamonium Phosphate (DAP) were applied to the trail and there were plot which was received zero urea and DAP fertilizers, named as control plots.



Plate 1: Irrigation

The fertilizers (Urea and DAP) were applied during the cauliflower hilling up. After urea application, the trail was slightly irrigated in order to avoid the urea fertilizer leaching and vaporization.

Application of pesticide

Pesticide was applied 5 times during the crop growing season under the commercial name of Dana dim 40% (plate 2).



Plate 2: Pesticide application

Observation Recorded

Observations were recorded throughout the trial, the plant height, plant spread and number of leaves/plant before harvesting and yield of head/plot as compared with different fertilizer rate, yield of head kg/plot and yield ton/hectare after harvesting.

Result and Discussion

Plant height (cm): The highest plant height (21.06 cm) was recorded at 100% NP at 20th June closely followed by (20.73 cm) at 75% NP, (18.73 cm) at 0% NP and lowest plant height was recorded (17.1 cm) with 50% NP. In case of fertilizer level, the highest plant height (36.36 cm) was recorded at 75% NP followed by (35.4 cm) at 100% NP and the lowest plant height (30.4 cm) was recorded in control treatment at 6th July. In the 20th July the highest plant height (45.66 cm) was observed at 50% NP followed by (44.33 cm) at 100% NP and the lowest plant height was (36.33 cm) recorded at control treatment, (Fig. 1). Jahan *et al.*, 2014 ^[3] reported the significant increases were in plant height (49.4 cm) by applying the vermicompost and conventional compost on cauliflower and also Chatterjee and Mahanta, 2013 ^[2] reported the highest plant height

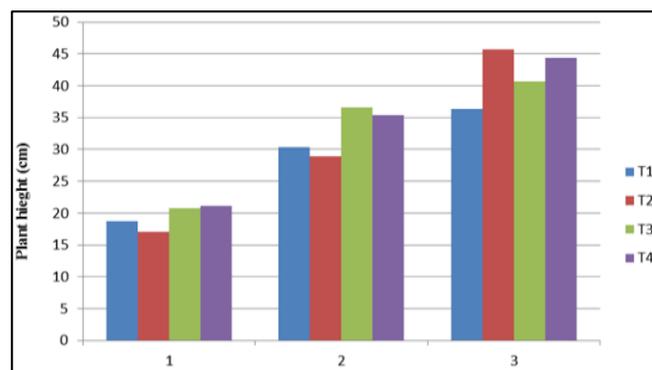


Fig 1: Effect of different fertilizer on plant height of cauliflower

Plant spread (cm): The result showed that different fertilizer level have significant effect on plant spread of cauliflower (Fig. 2). Among the different fertilizer levels, maximum plant spread (68.66 cm) was recorded at 100% NP fertilizer followed by (66.66 cm) at 50% recommended fertilizer dose and minimum plant spread was (58.33 cm) at control treatment at 20th July. Verma Hemlata and Nawange, 2015 ^[9] reported that the plant spread was 50.62 cm by using 150 kg/ha of nitrogen

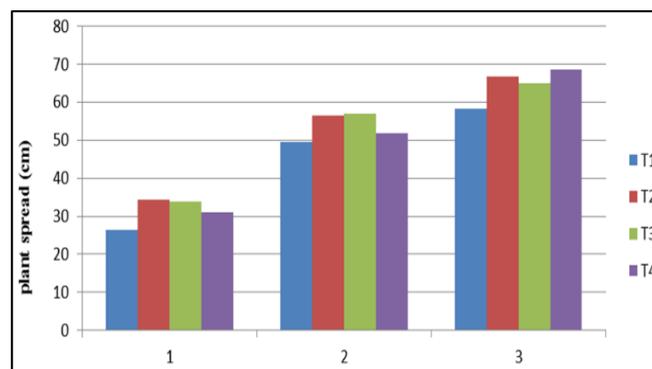


Fig 2: Effect of different fertilizer on plant spread of cauliflower

No. of leaves/plant: the different fertilizer application level (NP) showed that the maximum No. of leaves/plant (8.83 leave/plant) were found by using 100% NP at 20th June followed by (8.4 leave/plant) with 75% NP, while the minimum number of leaves/ plant (7.73 leave/plant) was observed at control treatment. The observation which was recorded at 20th July the maximum No. of leaves/plant (19.33 leave/plant) were observed at 75% NP followed by (18 leave/plant) with 50% N.P. and (16 leave/plant) with 100%

NP application, while the minimum number of leaves/plant was obtained with (15.66 leave/plant) 0%NP (Fig. 3). Chatterjee and S Mahanta, 2013^[2] reported the maximum No. of leaves (17.31/plant) was recorded by applying of 100%

recommended organic fertilizer plus 10 t/ha farmyard manure. Simarmata *et al*, 2016^[7] reported (17.8 leave/plant) was observed at T₆.

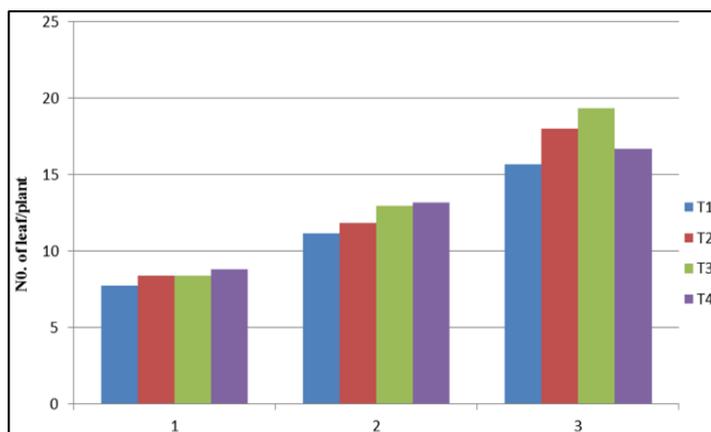


Fig 1: Effect of different fertilizer on leaves of cauliflower

Yield (m ton/ha): the indicated value shows that the highest yield (46.2 m ton/ha) was recorded at T₄ (100% NP) followed by (44.2 m ton/ha) at T₃ (75% NP) and lowest yield (28.6 m ton/ha) obtained in control treatment (table 1). The study shows that the NP application increases the cauliflower yield significantly. Feng *et al.*, 2004^[10] reported that K fertilizer was the most yield limiting factor for cauliflower. Yield

increased with K application rate up to 225kg/ha and they maintained a maximum yield was obtained with the complete treatment supplying N, P, K, Mg, B and Mo (30.3 ton/ha). Jahan, *et al.*, 2014^[3] reported that significant variation was found for the curd yield of cauliflower due to application of different treatments. Maximum curd yield was found from T₄ 37.6 tha⁻¹.

Table 1: effect of different levels of chemical fertilizer on yield (yield kg/plant, yield kg/plot and yield m ton/ha) of cauliflower.

Treatments	Yield kg/plant (mean)	Yield kg/plot 5.2 m ² (mean)	Yield m ton/he
T ₁ (control)	1.6	15	28.6
T ₂ (50% NP)	1.9	21	40.3
T ₃ (75% NP)	2.07	23	44.2
T ₄ (100% NP)	2.227	24	46.2
CD	N/A	4.728	
SE	0.128	1.34	
CV	11.35	11.18	
significance	5%	1%	

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