

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.810.251>

Effect of the Best Dose of N, P and K Fertilizers for Better Growth and Yield of Cauliflower (*Brassica oleracea* Var. *botrytiss* L.)

Gangesh Pandey, K. K. Mishra*, Aneeta Yadav and Abhishek Tiwari

Department of Horticulture, Faculty of Agricultural Sciences and Allied Industries,
Rama University, Kanpur (U.P.), India

*Corresponding author

ABSTRACT

Keywords

Cauliflower,
Snowball, Fertilizer,
Growth and Yield

Article Info

Accepted:
15 September 2019
Available Online:
10 October 2019

The area lies under the upper Gangetic plains region of Uttar Pradesh at an elevation of 126 m. above mean sea level. The investigation revealed that is very responsive to the different treatment combination that is T₁ control, T₂ NPK (30+20+10 kg/ha.), T₃ NPK (50+40+30 kg/ha.) T₄ NPK (75+50+40 kg/ha.), T₅ NPK (100+60+50 kg/ha.) and T₆ NPK (120+80+60 kg/ha.). All the treatment improve the vegetative growth and yield quality of cauliflower but T₆ {NPK (120+80+60) kg/ha.} gave the best results in terms of increasing size of curd, weight of curd, diameter of stem, plant height and yield followed by T₅ {NPK (100+60+50) kg/ha.}, T₄ {NPK (75+50+40) kg/ha.} and minimum recorded in control. Hence treatment T₆ { NPK(120+80+60) kg/ha.} for curd size, economic point of view and higher yield can be recommend for commercial cultivation of cauliflower production.

Introduction

Cauliflower (*Brassica oleracea* Var. *Botrytis* L.) is one of the important members of the group 'Cole crop' vegetables. It is belonging to Cruciferae family. The origin place of cauliflower is Mediterranean region. It is also one of the most important popular and widely cultivated all over India and abroad for its nutritive value, high productivity and wider adaptability under different ecological

condition. In India Uttarakhand, Uttar Pradesh, Himachal Pradesh, Haryana, Rajasthan, Bihar, Gujarat, Maharashtra, Odisha and Karnataka is produce large quantities of cauliflower.

It is also commonly grown in northern Himalayas and in Nilgiri hills in south. In its vegetative growth period, it may stand temperature as low as -10°C and as high as 40°C for a few days. Morphologically, the

curd of cauliflower is made up of numerous divided hypertropic branches, which terminate the main stem of the plant. It is good source of vitamin-A, vitamin-C, riboflavin, thiamin, nicotinic acid, calcium, phosphorus, potassium, moisture, carbohydrates, protein, fat, fiber and iron (Fageria *et al.*, 2012). Cauliflower is a deep rooted crop.

It remove a large amount of nitrogen, phosphorus and potash from the soil, wherever, it is grown and if this large amount is not supplied through the application of fertilizers, the soil on which this crop is grown is bound to deteriorate gradually and would produce very poor yields.

Intensive cultivation of vegetables needs additional supply of plant nutrients for increased production of vegetables as well as their seeds. Among the inorganic fertilizers, nitrogen encourages the development of leaves and shoots and imports a deep green colour to stem.

It is a constituent of both chlorophyll and protoplasm and is vitally essential to energy formation within the plant and development of its cellular contents.

Phosphorus (P) is one of the most essential plant nutrients that influence the growth and productivity of cauliflower.

Potassium is also equally important as structural components of all constituent and metabolically active compounds.

They hasten the maturity of crops, promote shoot developments, improve the productivity, quality of crop and increase the resistance against the disease. It also regulates water conduction within the plant cell and water loss from the plant by maintaining the balance between anabolism, respiration and transpiration.

Materials and Methods

The present investigation entitled," Effect of N, P and K fertilizers on the growth and yield of cauliflower (*Brassica oleracea* Var. *botrytis* L.) cv. Snowball" was carried out under the agro-climatic and soil conditions of Kanpur (U.P.) region during the rabi season, 2018- 19. The techniques and material used are described in the following heads:

Experimental Site

The experiment was laid out in the experimental area of Horticulture Section, Rama University Mandhana Kanpur (U.P.). The field was having good topography with adequate irrigation facilities.

Layout of experiment

The experiment was conducted in randomized block design (R.B.D.) with 6 treatments replicated fourth in 24 plots.

Detail of the experiment (Table 1)

Experiment Design	RBD (Randomized Block Design)
Number of treatment	6
Number of replication	4
Total number of plot	24
Plot border	0.25m
Distance, Row x Row	50cm
Plant x Plant	40cm
Net plot size	2.4m x 2.0m
Replication border	0.5m
Irrigation channel	1.0m
Variety	Snowball

Detail of treatment

There were six applications of mixture of N, P and K fertilizer in experiment as following.

T ₁	Control (No NPK)
T ₂	(30+20+10) kg/ha
T ₃	(50+40+30) kg/ha
T ₄	(75+50+40) kg/ha
T ₅	(100+60+50) kg/ha
T ₆	(120+80+60) kg/ha

Observations recorded

Observation on growth characters which ultimately influenced the yield i.e. height of plants at harvesting stage, diameter of stem, and number of leaves per plants were recorded at regular intervals of 20 days commencing from 20 days after transplanting.

Observations regarding the curd character like size of curd, weight of curd per plant, yield per hectare were recorded at the time of harvesting.

Results and Discussion

The result obtained during the course of present experiment "Effect of mixture of N, P and K fertilizers on the growth and yield of cauliflower (*Brassica oleracea* Var. *botrytis* L.) cv. Snowball" has been presented under suitable heads. Observations were recorded during the growth phase at interval of 20 days commencing from 20 days after transplanting, while, the last observation was recorded at 60 days after planting and on yield attributing characters per plant at the time of picking of cauliflower curd. Measurement of the height of plant was started 20 days after transplanting with an interval of 20 days. The height of the plant as affected by different treatments is given in Table 2. At all the growth stages, maximum plant height was recorded under the mixture application of T₆ (120+80+60) kg/ha N,P,K, followed by T₅ (100+60+50) kg/ha N,P,K and minimum height was recorded under T₂ (30+20+10) kg/ha NPK followed by T₁ (No N,P,K) (Fig. 1). The maximum stem

diameter was produced under the mixtures of NPK fertilizers T₆ (120+80+60) kg/ha NPK at all the stages, followed by T₅ (100+60+50) kg/ha N, P and K (Fig. 2). While the minimum stem diameter was recorded under the mixtures of NPK fertilizers T₂ (30+20+10) kg/ha NPK followed by T₁ control (No NPK). It is evident from the Table 3. The number of leaves was recorded at 20 days interval commencing from 20 days after planting and the data of all the subsequent growth stages are presented in Figure 3. Maximum and significantly higher number of leaves/plant was observed under mixtures of NPK fertilizers T₆ (120+800+60) kg/ha NPK, followed by T₅ (100+60+50) kg/ha NPK at all the growth stages (Table 4).

While, minimum No. of leaf per plant were observed under T₂ (30+20+10) kg/ha NPK followed by T₁ (No NPK). The average size of cauliflower curd was recorded at the time of picking shown in Figure 4. The mixture of NPK fertilizers application T₆ (120+80+60) kg/ha NPK gave maximum size of cauliflower curd in comparison to the other mixture of fertilizers. It was followed by mixture of fertilizers T₅ (100+60+50) kg/ha NPK. While, minimum size of curd were observed in T₃ (50+40+30) kg/ha NPK followed by T₂ (30+20+10) kg/ha NPK. Treatment T₆ (120+80+60) kg/ha NPK produced cauliflower curds of maximum length (21 cm) followed by mixture of NPK fertilizer application T₅ (100+60+50) kg/ha NPK produced cauliflower curd. Maximum length (19.85 cm) found T₂ (30+20+10) kg/ha NPK and minimum length of cauliflower curd (11.70 cm) in T₁ control. Maximum width of cauliflower curds (17.30 cm) found in T₆ (120+80+60) kg/ha NPK followed by T₅ (100+60+50) kg/ha NPK while minimum width of cauliflower curd T₁ (Control No NPK).

Table.1 Details of operations performed in the experiments

S. No.	Operation	Date
1.	First ploughing by cultivator	23-11-2018
2.	Second ploughing by rotavator	24-11-2018
3.	Basal dose NPK	24-11-2018
4.	Transplanting of seedling	25-11-2018
5.	Water by water cane	25-11-2018
6.	Irrigation-I	29-11-2018
7.	Gap filling	02-12-2018
8.	Weeding and hoeing	06-12-2018
9.	Irrigation-II	08-12-2018
10.	First Observation	15-12-2018
11.	Irrigation-III	18-12-2018
12.	Urea I split dose	25-12-2018
13.	Irrigation-IV	26-12-2018
14.	Second observation	04-01-2019
15.	Insecticide spray	04-01-2019
16.	Irrigation-V	06-01-2019
17.	Weeding Second	15-01-2019
18.	Remaining dose of Urea	16-01-2019
19.	Irrigation-VI	16-01-2019
20.	Third observation	24-01-2019
21.	Irrigation-VII	26-01-2019
22.	Picking-I	03-02-2019
23.	Irrigation-VIII	04-02-2019
24.	Picking-II	09-02-2019
25.	Irrigation-IX	12-02-2019
26.	Final Picking	16-02-2019

Table.2 Effect of different dose of N, P and K fertilizers on plant height (cm)

Sr. No.	Treatment	Plant Height (cm)		
		20 Days	40Days	60Days
1	Control	7.00	18.79	27.64
2	(30+20+10) kg./ha NPK	7.57	19.39	29.58
3	(50+40+30) kg./ha NPK	8.64	19.90	30.97
4	(75+50+40) kg./ha NPK	9.63	20.82	32.00
5	(100+60+50+) kg./ha NPK	10.54	21.95	32.52
6	(120+80+60) kg./ha NPK	11.28	22.72	33.68
SE±(m)		0.35	0.09	0.38
C.D.		1.06	0.94	1.15

Table.3 Effect of different dose of NPK fertilizer on diameter of stem (cm)

Sr. No.	Treatment	Diameter of Stem (cm)		
		20 Days	40Days	60Days
1	Control	0.36	1.14	1.48
2	(30+20+10) kg./ha NPK	0.42	1.25	1.55
3	(50+40+30) kg./ha NPK	0.43	1.40	1.68
4	(75+50+40) kg./ha NPK	0.49	1.52	1.80
5	(100+60+50+) kg./ha NPK	0.53	1.64	1.91
6	(120+80+60) kg./ha NPK	0.57	1.70	1.93
SE±(m)		0.01	0.01	0.03
C.D.		0.03	0.05	0.10

Table.4 Effect of N, P and K fertilizer at number of leaf per plant

Sr. No.	Treatment	No. Of Leaf		
		20 Days	40Days	60Days
1	Control	3.75	9.75	12.22
2	(30+20+10) kg./ha NPK	5.12	11.00	14.00
3	(50+40+30) kg./ha NPK	6.37	13.57	15.60
4	(75+50+40) kg./ha NPK	7.37	14.87	16.87
5	(100+60+50+) kg./ha NPK	8.75	16.87	17.37
6	(120+80+60) kg./ha NPK	9.87	19.75	21.12
SE±(m)		0.18	0.34	0.44
C.D.		0.55	1.04	1.34

Table.5 Effect of mixture of different dose of NPK fertilizer on size of curd (cm)

Sr. No.	Treatment	Size Of Curd (cm)	
		Length	Width
1	Control	11.70	9.05
2	(30+20+10) kg./ha NPK	14.65	11.75
3	(50+40+30) kg./ha NPK	16.60	13.55
4	(75+50+40) kg./ha NPK	18.25	14.70
5	(100+60+50+) kg./ha NPK	19.85	16.00
6	(120+80+60) kg./ha NPK	21.00	17.30
SE±(m)		0.38	0.25
C.D. at 5 %		1.15	0.75

Table.6 Effect of different dose of NPK fertilizer on weight of curd (g)

Sr. No.	Treatment	Weight of Curd at Harvesting Stage (cm)
1	Control	198.30
2	(30+20+10) kg./ha NPK	241.21
3	(50+40+30) kg./ha NPK	289.93
4	(75+50+40) kg./ha NPK	336.25
5	(100+60+50+) kg./ha NPK	415.04
6	(120+80+60) kg./ha NPK	529.68
SE±(m)		2.63
C.D.		7.94

Table.7 Effect of different dose of NPK fertilizer on yield of cauliflower/ha

Sr. No.	Treatment	Yield of Curd (q/ha)
1	Control	79.70
2	(30+20+10) kg./ha NPK	99.75
3	(50+40+30) kg./ha NPK	120.12
4	(75+50+40) kg./ha NPK	144.87
5	(100+60+50+) kg./ha NPK	168.12
6	(120+80+60) kg./ha NPK	206.57
SE±(m)		3.33
C.D.		10.04

Fig.1 Effect of different dose of N, P and K fertilizers on plant height (cm)

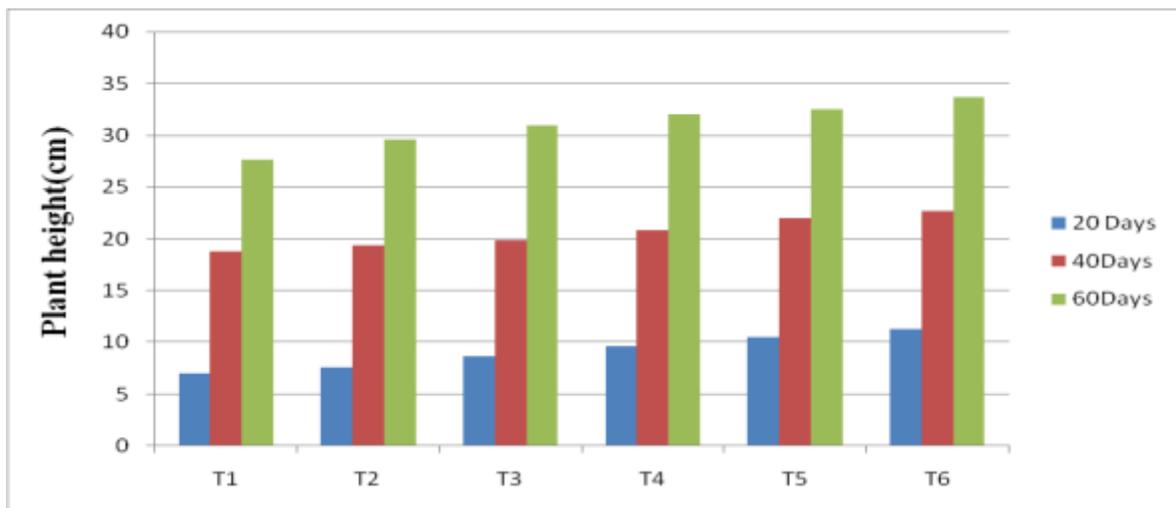


Fig.2 Effect of N, P and K fertilizer on diameter of stem/plant (cm)

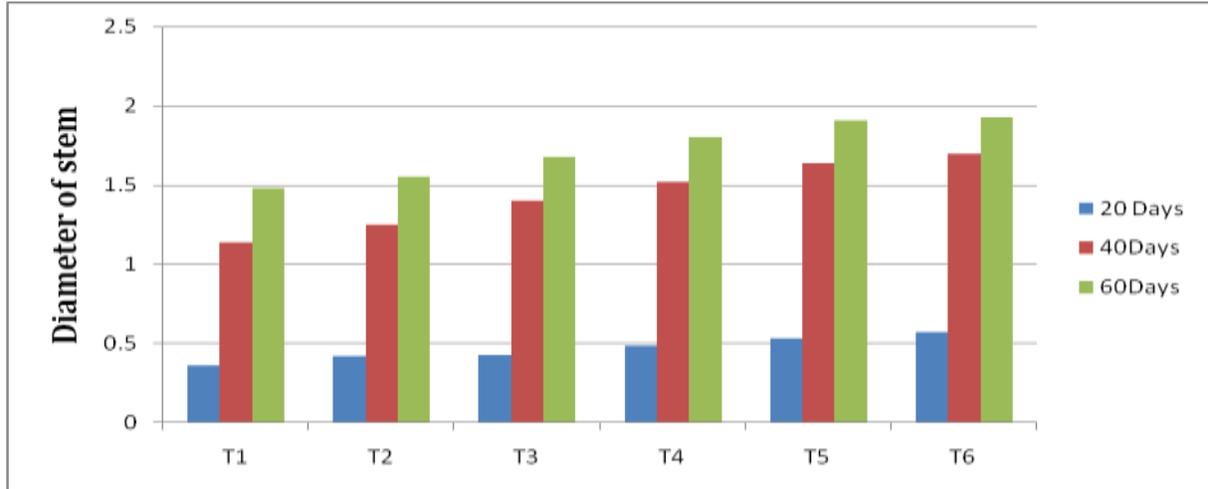


Fig.3 Effect of N, P and K fertilizer at number of leaf per plant

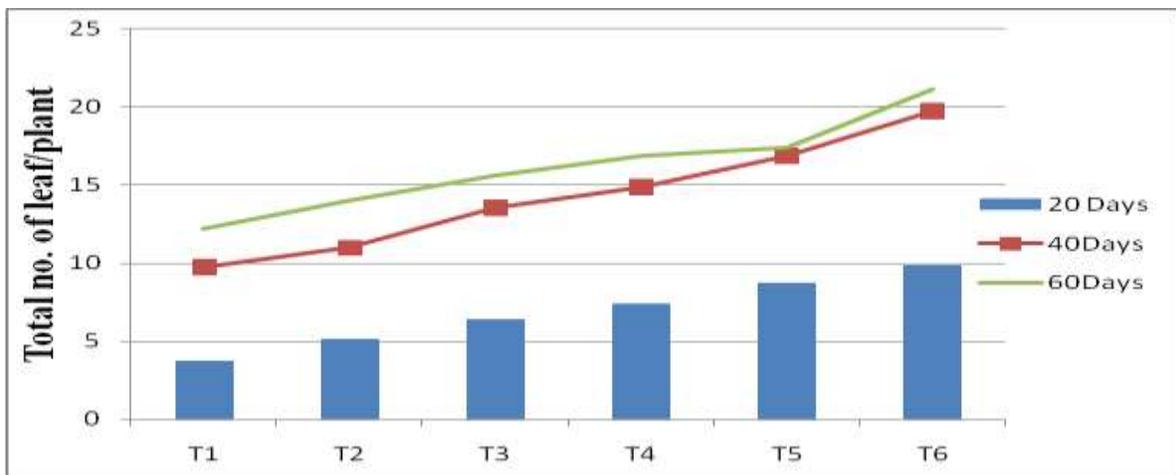


Fig.4 Effect of N, P and K fertilizer on size of curd

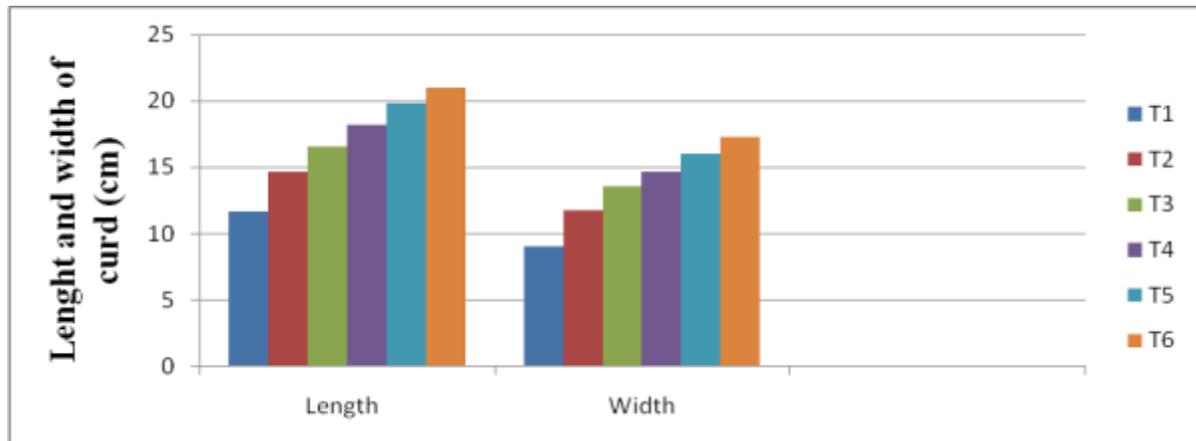


Fig.5 Effect of different dose of NPK fertilizer on weight of curd (g)

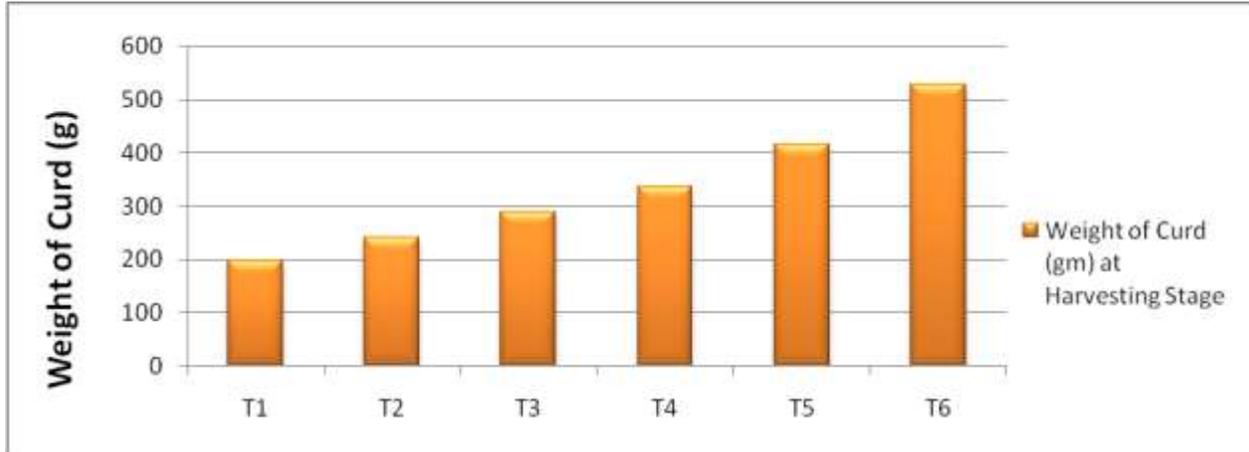
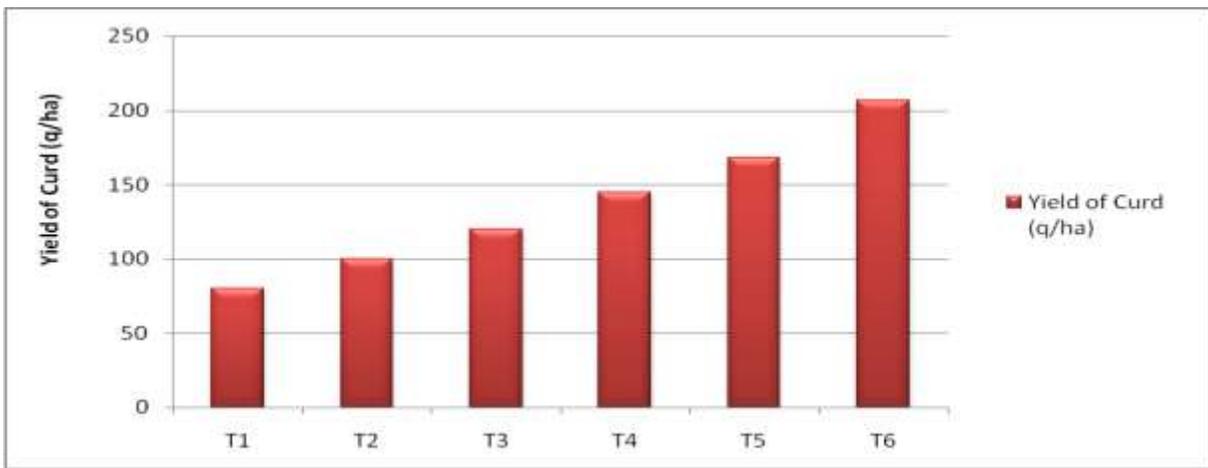


Fig.6 Effect of different dose of NPK fertilizer on yield of cauliflower/ha



The yield/plot under different treatments were recorded at the time of subsequent picking and converted into yield q/ha and presented in Table 7.

The average weight of curd produced by different treatments is presented in Table 6 and shown graphically in Figure 5. The mixture of NPK fertilizers T₆ (120+80+60) kg/ha NPK contributed more weight of curd (529.68 g) followed by T₅ (100+60+50) kg/ha NPK giving 415.04 g curd weight/plant. Minimum weight was recorded with T₁ (No NPK).

The data presented in table 7 indicate that mixture of NPK fertilizers T₆ (120+80+60) kg/h NPK gave significantly higher yield (206.57 q/ha), followed by mixture of fertilizers T₅ (100+60+50) kg/ha NPK observed (168.12 q/ha) and minimum in found T₁ (Control) (99.75 q/ha). These views are also reported by many scientists like Everaarts and DE Willigen (1999), Ahmed *et al.*, (2003). Randhawa and Bhail (1976) and Cutecliffe and Munro (1976). Rajput and Singh (1975) reported the best results in response to 80 kg/ha as a basal dose followed by top dressing.

Findings of the scientists Tripathi (2012), Kodithuwakku and Kirthisinghe (2009), Pawar and Barkule (2017) also support the present result.

References

- Ahmed, S; Ahmed, F.; Faridullah and Hussain, M. (2003). Effect of different NPK levels on the growth and yield of kohlrabi (*Brassica caulorapa* L.) at Northern areas of Pakistan. *Asian J. Plant Sci.* 2(3): 336-338.
- Everaarts, A.P., and P. DE Willigen (1999). The effect of nitrogen and the method of application on yield and quality of broccoli *Netherlands J. of Agri. Sci.* 47-123-133.
- Kodithuwakku, D.P. and J.P. Kirthisinghe (2009). The Effect of Different Rates of Nitrogen Fertilizer Application on the Growth, Yield and Postharvest Life of Cauliflower (*Brassica oleracea* var. *botrytis* L.). *Tropical Agri. Res.*, 21(1): 110-114.
- Pawar R. and Barkule S. (2017). Study on effect of integrated nutrient management on growth and yield of cauliflower (*Brassica oleracea* var. *botrytis* L.). *J. of App. and Natural Sci.*, 9(1): 520-525.
- Rajput, C.B. and Singh, K. P. (1975). Response of cauliflower cultivar, "snowball-16" to various levels, methods on nitrogen application. *Bangia Desh Hort.*, 3(7): 23-30.
- Randhawa, K.S. and Bhail, A.S. (1976). Grow the yield and quality of cauliflower, (*Brassica oleracea* var. *botrytis* L.) as influenced by nitrogen, phosphorus and boron. *Indian J. Hort.*, 83.

How to cite this article:

Gangesh Pandey, K. K. Mishra, Aneeta Yadav and Abhishek Tiwari. 2019. Effect of the Best Dose of N, P and K Fertilizers for Better Growth and Yield of Cauliflower (*Brasica oleracea* Var. *botrytiss* L.). *Int.J.Curr.Microbiol.App.Sci.* 8(10): 2153-2163.
doi: <https://doi.org/10.20546/ijcmas.2019.810.251>