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## Growth, yield and quality of Cauliflower (*Brassica oleracea* L. var. botrytis) as influence by different doses of nitrogen

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### Abstract

The present experiment was conducted under field conditions on cauliflower in randomized block design (R.B.D.) with three replications at the farm of Udai Pratap Autonomous College, Varanasi (U.P.) during the year 2015-2016. The different treatment were comprises urea, farm yard manure and neem cake. During the experimentations, observations were recorded on various growth and yield characters of cauliflower. Nitrogen sprayed in the form of urea was found significant in each growth characters at all the stages. Growth characters i.e. number of leaves per plant, height, thickness, fresh weight and dry weight of leaves and curd. Yield was greatly influenced by various levels of nitrogen. Highest fresh weight 994.60 g, dry weight 99.0 g and yield 397.70 q/ha was recorded under the treatment FYM @ 20 t/ha + Neem cake @ 5t/ha + Urea @ 150:80:60 kg/ha.

**Keywords:** Cauliflower, fresh weight, dry weight, yield

### Introduction

In India, agriculture is the common ground for rural economy and vegetable production is one of the most important commercial aspects of farming consequently the prime need of agriculture is to boost up the production of vegetable by improved cultural practices, it also raise the socioeconomic status of common people. According to dietician an adult individual requires 300 g of vegetables per day. At present in India, the per capita per day consumption of vegetable is only 235 g, which is much less than developed country. The cauliflower is an important winter season vegetable crop of India. It was introduced into from England by Dr. Jemson Incharge of Company Bagh, Saharanpur, and U.P. in 1822. Cauliflower is grown for white tender head or curd formed by the shortened flower plants. It may be cooked alone or mixed with other vegetables. It is good source of vitamin A, vitamin B and fair amount of protein. India stands second in vegetable production after china in the world and first in cauliflower production. Cauliflower produces the best curds in a cool and slightly moist climate. The optimum monthly average temperature required for its production is in the range of temperature 15°C to 20°C. Cauliflower can be grown on any good soil, but a fairly deep loamy soil is most desirable. It is sensitive to high acidity. The optimum soil pH for maximum production is 5.5-6.0. Cauliflower is a shallow-rooted crop. Its roots are confined to 45 cm to 60 cm depth. Drip irrigation is the most suitable irrigation method for uniform head size and high quality produce.

There are close constructive relationships between nitrogen status and plant growth marked by the close relation-ship between photosynthesis and nitrogen at the single-leaf level (Evans, 1983) as well as for relative growth rate of the whole-plant (A Ê gren, 1985) <sup>[1]</sup>. However, positive effects of high nitrogen contents on productivity are accompanied by increased rates of respiration (Penning de Vries *et al.*, 1974; Byrd *et al.*, 1992; Alt *et al.*, 2000) <sup>[11, 3, 2]</sup> which may partly effects the benefits of high nitrogen contents on net carbon accumulation rates. A decrease in plant nitrogen content per unit dry weight with increasing plant dry weight has been observed for many crops (Greenwood *et al.*, 1990; Lemaire *et al.*, 1992; Vos *et al.*, 1996) <sup>[7, 9, 13]</sup> and has been termed the 'law of progressive decline' in plant nitrogen concentration during crop growth (LeBot *et al.*, 1998) <sup>[8]</sup>. Nitrogen availability to the plant must be sufficient. When nitrogen supplies are sufficient, carbohydrate are deposited in vegetative cells, which cause than to thicken. When nitrogen supply is adequate and conditions are favorable for the growth, proteins are formed from manufactured carbohydrates.

When plants are deficient in nitrogen, chlorosis occurs, than the plants may be stunted in growth and become yellow. Not only the deficiency of nitrogen but also excess of nitrogen produces harmful effect on the plants i.e., prolong the growing period and delay in crop maturity. Excess of nitrogen reduce the amount of total sugar and plants become more susceptible to diseases. In absence of nitrogen, buttoning appears in cauliflower, where plants develop only small heads or buttons. The plants do not develop normally and the leaves remain small and do not cover the developing heads. So, keeping all aspects in our mind the present investigation is to study growth, yield and quality of cauliflower under different doses of nitrogen.

### Materials and methods

The present investigation was conducted during 2015-2016 in Randomised block design at the horticulture garden of Uday Pratap Autonomous College, Varanasi (U.P.). During the crop season average maximum/minimum, temperature/humidity was recorded 29.9°C/12.4°C, 89% /62%, whereas, 8.9 mm of average rain fall was also measured. A homogeneous piece of land was selected from composite block of the horticultural garden having an even topography with adequate irrigation facilities and drainage. The soil was sandy loam and has good fertility. For mechanical and chemical analysis of soil, aggregate soil samples were drawn from the experimental field (0-20 cm depth) prior to the application of farm yard manure to assess the initial physical and chemical status of soil. The results of analysis showed that soil contains 40% sand, 30% silt, 26% clay, whereas, pH measured 6.7, organic carbon 0.49%, Electrical conductivity 0.35 dSm<sup>-1</sup>, available nitrogen 192 kg/ha, phosphorus 26 kg/ha and potash 130 kg/ha. Treatments involves, T1- control, T2-FYM @ 10 t/ha + Neem cake @ 2.5t/ha + Urea @ 75:40:30 kg/ha, T3- FYM @ 10 t/ha + Neem cake @ 2.5t/ha + Urea @ 150:80:60 kg/ha, T4- FYM @ 10 t/ha + Neem cake @ 5t/ha + Urea @ 75:40:30 kg/ha, T5- FYM @ 10 t/ha + Neem cake @ 5t/ha + Urea @ 150:80:60 kg/ha, T6- FYM @ 20 t/ha + Neem cake @ 2.5t/ha + Urea @ 75:40:30 kg/ha, T7- FYM @ 20 t/ha + Neem cake @ 2.5t/ha + Urea @ 150:80:60 kg/ha, T8- FYM @ 20 t/ha + Neem cake @ 5t/ha + Urea @ 75:40:30 kg/ha, T9- FYM @ 20 t/ha + Neem cake @ 5t/ha + Urea @ 150:80:60 kg/ha.

The field was ploughed by tractor driven soil turning plough. A basal application of F.Y.M. at the rate of 250q/ha was done before one month of transplanting. Each ploughing was followed by planking till the optimum tilth achieved. The required area was marked and plots were prepared according to the plan of lay-out. Healthy certified seed of cauliflower was used to rise on nursery beds and regular care of nursery was taken for proper development of seedlings. Five weeks seedlings were transplanted at the distance of 45 x 60 cm. First irrigation was given just after transplanting and subsequent 4-5 irrigation was given to the crop at different intervals according to the need of crop. Nitrogen was supplied in the form of farm yard manure, neem cake, and urea in the form of basal dressing before transplanting also. Various growth characters were recorded at 25, 45, 65, 85 and 105 days after transplanting. The observations recorded are vegetative, curd and yield characters. In order to examine the significant occurring from treatment to treatment, days to observation and their interaction effects were subjected to statistical analysis by method of panse and sukhatme (1954)<sup>[10]</sup>, and fisher and Yates (1963)<sup>[6]</sup>. The graphical representation of the analysed data was don on the simple

Microsoft excel.

### Experimental findings

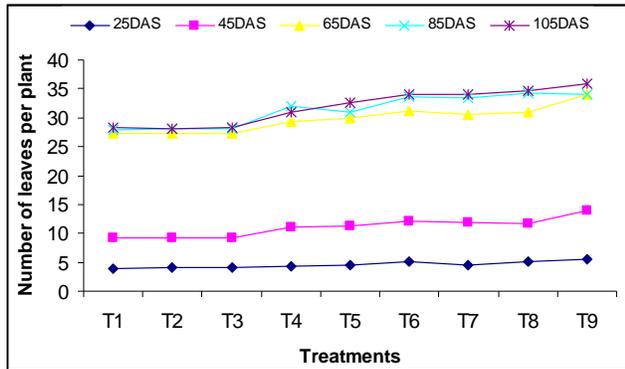
Application of nitrogen gave significant response to various growth characters and yield of cauliflower at different stage. Regarding number of leaves per plant, maximum was noted in T9 (5.6, 14.0, 34.0 and 36.0 after 25, 45, 65 and 105 days of sowing respectively), whereas, after 85 days of sowing it was observed 34.3 under treatment T8 (fig 1a). In cauliflower, EL Behendi and EL Mansi (1973)<sup>[4]</sup> have also found increase in leaf number with increasing nitrogen supply. The highest values of height of plant were noted as 18.1, 30.1, 51.6, 52.2, 54.6 under treatment T9 level after 25, 45, 65, 85, and 105 days after sowing (fig 1b). Regarding thickness of Cauliflower stem, highest values were noted as 0.50cm, 1.31cm, 2.29cm, 2.50cm and 2.84cm under FYM @ 20 t/ha + Neem cake @ 5t/ha + Urea @ 150:80:60 kg/ha at 25, 45, 65, 85, and 105 days of plant life, whereas, minimum values were noted under the treatment T1 (fig 1c). The fresh weight of whole per plant was greatly influenced by various treatment and combination at various stages of development. The highest values were observed 10.20g, 74.53g, 685.66g, 922.90g and 935.56g under treatment FYM @ 20 t/ha + Neem cake @ 5t/ha + Urea @ 150:80:60 kg/ha after 25, 45, 65, 85, and 105 days of plant life respectively (fig 1d ). Similarly dry weight was also highest under T9 after consecutive days of sowing (fig 1e). Regarding fresh weight of leaves, highest values were noted 6.7 g, 53.3g, 540.1g, 681.8g and 700.6g under T9 at 25, 45, 65, 85, and 105days after sowing. (fig 1f). Similarly the highest values were noted as 0.47g, 4.59g, 65.86g, 77.36g and 77.30g under T9 at 25, 45, 65, 85, and 105days of plant life respectively of dry weight of leaves (fig1g).

The fresh weight of curd per plant was greatly influenced by various treatments and their combination at various stages of development. The interaction of nitrogen was found significant at 105 days after sowing. The highest values were noted as 994.6g under the treatment T9 whereas, minimum 738.0g under T2 after 105 days of sowing. Likewise dry weight of curd per plant, it was observed 98.96g highest in T9 (fig 1h). Fresh weight of plant, leaf and length of the plant had also increased due to application of nitrogenous fertilizers. 120 kg N per hectare significantly increased these characters followed by 60 kg N per hectare at all stages of growth. Favourable effect of nitrogen on the growth of cauliflower have been reported by Rajput and Singh (1975)<sup>[12]</sup>.

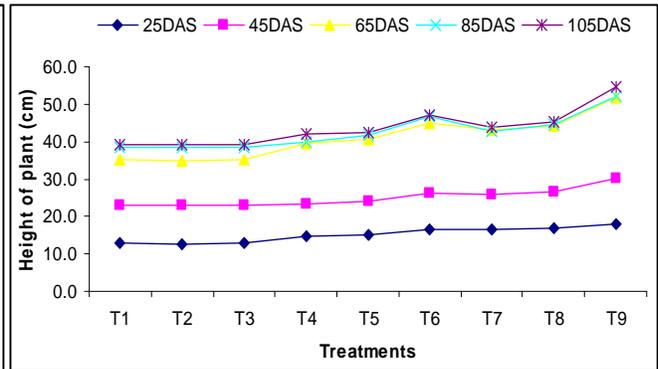
Deficiency of nitrogen resulted reduced fresh weight of constituents organs and whole plant, the reduced growth of cauliflower under nitrogen deficiency was mainly due to reduced number of leaf and leaf size. Nitrogen resulted in decreased protein content and increased soluble sugars which are known to limit cell expansion and still more cell division. On the basis of above findings, the result of the experiment clearly showed that nitrogen to essential for increase in growth characters of cauliflower plant. Like fresh weight of constituent organs, dry weight of the same also greatly influenced by nitrogen application. The highest level of nitrogen, i.e. 120 kg per hectare significantly increased the weight of constituents organs over 60 kg and control. It is a well known fact that nitrogen enhances vegetative growth and their by increases dry matter accumulation. The dry matter accumulation in cauliflower was increased by application of nitrogen. The possible explanation may be that nitrogen increases the production of green leaves which help in the

synthesis of carbohydrate, protein, and nitrogenous compounds essential for building up for new tissues. Nitrogen also affects the chlorophyll formation which in turn accelerate the rate of photosynthesis eventually increase in the growth which ultimately results into the formation of dry matter. The interaction of nitrogen was found significant at 105 days after sowing regarding yield of curd; it was noted highest 397.70q/ha under treatment T9 at 105 days of plant life. The minimum values were noted as 295.20q/ha under T1 (fig 1i).

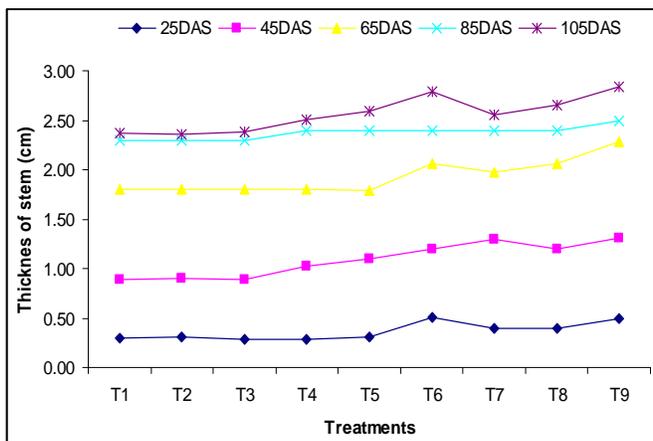
In view of the above results it was concluded that nitrogen application increased the yield and yield attributing as compared to control. Nitrogen application at the rate of 120 kg per hectare significantly increased all the yield attributing characters. Rajput and Singh (1975) [12] obtained that cauliflower variety snowball gave significantly higher yield to nitrogen treatment combination 0 kg, 40 kg, 80 kg and 120 kg per hectare and last two were significantly higher than control.



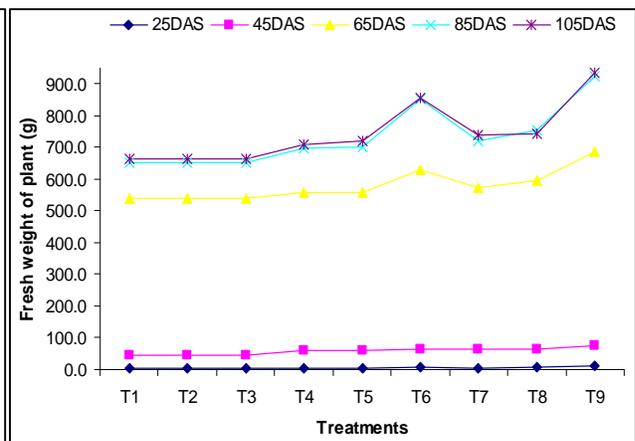
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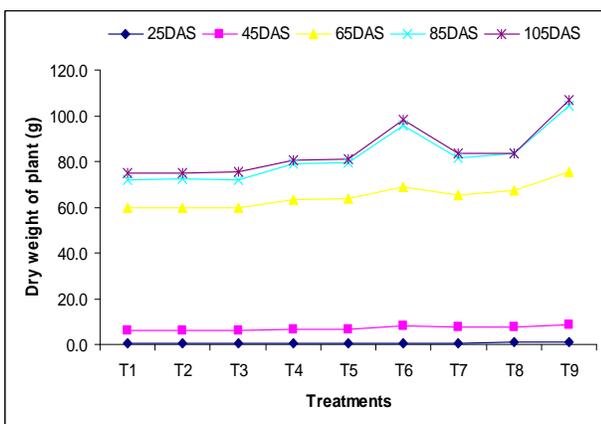
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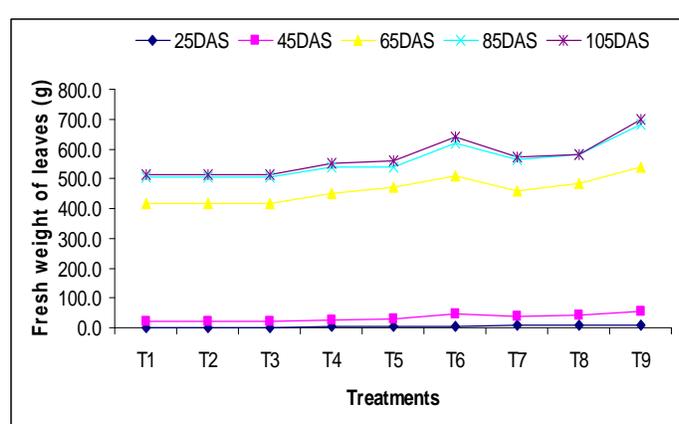
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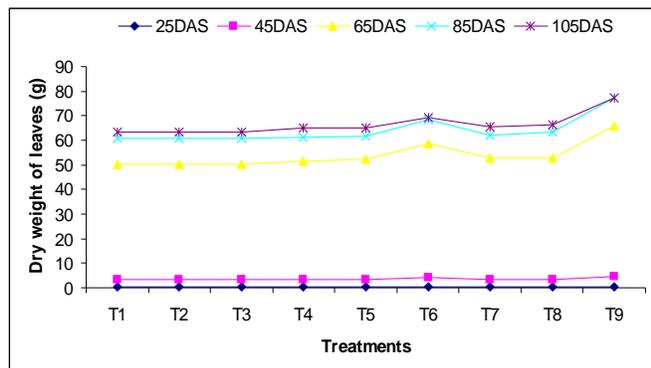
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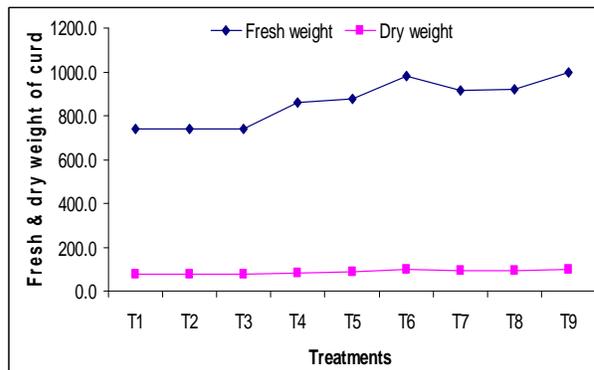
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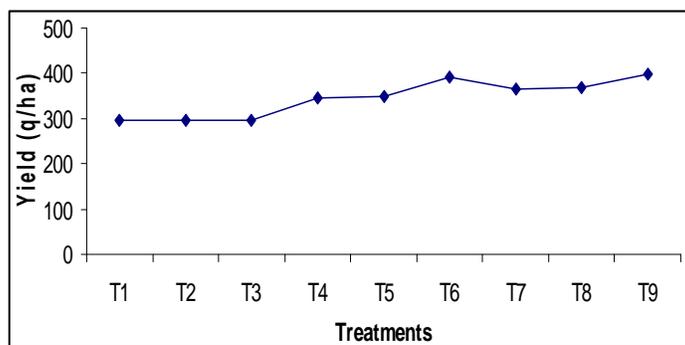
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1i

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