

Research
Paper

Influence of integrated nutrient management on curd yield, quality and nutrient uptake and economics of cauliflower (*Brassica oleracea* var. *Botrytis* L.) under middle Gujarat

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ABSTRACT

An experiment on integrated nutrient management in cauliflower was conducted at Agronomy Farm, B.A. College of Agriculture, Anand Agricultural University, Anand during *Rabi* season of the year 2006. The treatment comprised of four levels of organic manures (FYM @ 15 and 20 t ha⁻¹ and vermicompost @ 3 and 4 t ha⁻¹) and three NPK levels (100% RDF, 75% RDF and NPK as per soil test values). Application of vermicompost @ 3 or 4 t ha⁻¹ recorded higher curd yield, protein content, nutrient uptake and net realization as compared to FYM application. In case of inorganic fertilizer treatments, curd yield, protein content and nutrient uptake as well as net realization were noticed with the application of 200:75:37.5 kg NPK ha⁻¹ (100% RDN).

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KEY WORDS : Curd yield, Cauliflower, Integrated nutrient management, Nutrient update

Cauliflower (*Brassica oleracea* var. *Botrytis* L.) is a valuable vegetable crop because of its nutritional value and wide spread production. However, there are many problems in its cultivation. Balanced nutrition has tremendous scope for increasing its production by adopting scientific integrated nutrient management system. Integrated nutrient management minimized the dependence of crop production on chemical fertilizers alone. In addition, organic sources such as farm yard manure, vermicompost, pressmud, etc. have cumulative and residual effects in improving physical condition, chemical properties and biological environment of soil which not only reduces the need of chemical fertilizers but also sustain the productivity of soil. Inclusion of organic manures with inorganic fertilizers may serve as a chelating and complexing agents which prevent the nutrients from precipitation, fixation, oxidation and leaching. Use of organic manure leads to higher and sustainable crop production. However, the contents of nutrient in organics are in small quantities, therefore, their sole additions at a lower rate do not meet the nutrient requirement of crops. The availability of different organics as per the recommended dose is questionable for many farmers.

RESEARCH PROCEDURE

The field experiment was conducted at Agronomy Farm, B.A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) on a soil which had neutral pH (7.88) medium in soluble salt (0.21 dSm⁻¹) and low in organic carbon (4.9 g kg⁻¹). The soil was high in available P₂O₅ (58.5 kg ha⁻¹) and K₂O (425 kg ha⁻¹). The experiment was laid out in split plot design by keeping organic matter in main plot and inorganic fertilizers in sub-plot treatment in three replications. The twelve treatments were formed comprising different levels as under:

Main plot treatment:

Organic manures (Four levels):

M₁: FYM @ 15 t ha⁻¹

M₂: FYM @ 20 t ha⁻¹

M₃: vermicompost @ 3 t ha⁻¹

M₄: vermicompost @ 4 t ha⁻¹

Sub-plot treatment:

Inorganic fertilizers (Three levels):

F₁: 100 per cent RDF (200:75:37.5 kg NPK ha⁻¹)

F₂: 75 per cent RDF (150:56.25:28.20 kg NPK ha⁻¹)

F_1 : NPK kg ha⁻¹ as per soil test value

The required quantity of organic manures were applied and thoroughly mixed in the plots as per treatments. Total quantity of P, K and half of the N were applied as a basal at the time of land preparation, while remaining half quantity of N was given one month after transplanting as a top dressing. Thirty days old, almost uniform, well developed and healthy seedlings of cauliflower were selected and transplanted in the field on 10th Nov., 2006. The chemical analysis of the plant samples (P and K curd) was carried out by wet digestion with (HNO₃ : HClO₄) diacid mixture as per the procedure outlined by Jackson (1973). The N content of curd samples was estimated and the protein content was calculated by multiplying 6.25 to per cent N content. The data on fresh curd yield, protein content and nutrient uptake by crops were statistically analyzed as per Panse and Sukhatme (1961).

RESEARCH ANALYSIS AND REASONING

The results obtained from the present investigation have been discussed below:

Effect of organic manures:

The effect of application of FYM and vermicompost on curd yield, protein content, nutrient uptake and economics of cauliflower are presented in Table 1.

Curd yield:

The treatment M₄ was found significantly superior

than M₂ and M₁ but statistically at par with M₃. The mean increase in curd yield of cauliflower under the treatment M₄ was 17.5 and 15.4 per cent higher over M₂ and M₁, respectively. The significant increase in curd yield of cauliflower was recorded with the application of vermicompost @ 3 and 4 t ha⁻¹ over FYM @ 15 and 20 t ha⁻¹. The increase in yield could be attributed to supplementation of nutrients to the soil. The reason behind the more availability of organic materials for multiplication of micro-organisms which helped in improving the nitrogen availability in soil. Comparatively lower yield of crop under M₂ and M₁ (FYM @ 20 and 15 t ha⁻¹) could possibly be due to partly immobilization of inorganic N there by lesser supply of N during earlier growth stage. These findings are in agreement with the finding of Parmer and Sharma (2001) and Kanwar *et al.* (2002).

Protein content:

The organic manurial treatments did not exert significant effect on protein content of cauliflower curd, however, numerically the maximum (17.93 %) and minimum (16.44 %) protein content was recorded under M₄ (4 t VC ha⁻¹) and M₂ (20 t FYM ha⁻¹) treatments, respectively.

Nutrients uptake:

Looking to the data on N uptake by cauliflower curd, treatment M₄ was found significantly superior over M₂ and M₁ but statistically at par with M₃. An application of vermicompost increases the total microbial population of

Table 1 : Effect of FYM, vermicompost and NPK levels on curd yield, protein content, nutrient uptake and economics of cauliflower

| Treatments | Curd yield (t ha ⁻¹) | Protein content (%) | Net realization (Rs. ha ⁻¹) | BCR | Uptake of major nutrients (kg ha ⁻¹) | | |
|--|-------------------------------------|------------------------|--|------|--|-------|--------|
| | | | | | N | P | K |
| FYM and vermicompost levels (M) | | | | | | | |
| M ₁ : 15 t FYM 1 ha ⁻¹ | 51.20 | 16.51 | 1,31,651 | 6.00 | 133.80 | 33.10 | 175.27 |
| M ₂ : 20 t FYM 1 ha ⁻¹ | 50.28 | 16.44 | 1,26,894 | 5.30 | 131.26 | 31.87 | 173.06 |
| M ₃ : 3 t VC ha ⁻¹ | 58.97 | 17.60 | 1,51,967 | 6.09 | 156.72 | 39.99 | 199.37 |
| M ₄ : 4 t VC ha ⁻¹ | 59.06 | 17.93 | 1,48,917 | 5.33 | 159.1 | 40.60 | 202.04 |
| S.E. ± | 1.77 | 0.34 | - | - | 6.20 | 2.020 | 10.78 |
| C.D. (P = 0.05) | 6.13 | NS | - | - | 21.44 | 6.99 | NS |
| CV % | 9.69 | 6.03 | - | - | 12.80 | 16.65 | 17.25 |
| NPK level(S) | | | | | | | |
| S ₁ : 100% RDF | 60.06 | 18.02 | 1,80,582 | 8.19 | 158.54 | 43.12 | 228.03 |
| S ₂ : 75% RDF | 55.51 | 17.17 | 1,47,823 | 7.91 | 149.73 | 38.74 | 190.78 |
| S ₃ : NPK as per soil test value | 49.06 | 16.16 | 1,29,764 | 7.56 | 101.32 | 27.31 | 143.49 |
| S.E. ± | 0.79 | 0.28 | - | - | 3.93 | 0.93 | 6.62 |
| C.D. (P = 0.05) | 2.38 | 0.83 | - | - | 11.78 | 2.79 | 19.85 |
| CV % | 5.01 | 5.63 | - | - | 9.37 | 8.86 | 12.24 |

NS=Non-significant

nitrogen fixing bacteria which increased microbial activity and improved availability of nitrogen in soil, which helped in increased yield and their by increase the uptake of N by crop. Similar results were also consonant with the Sreeniwas *et al.* (2000) and Kanwar *et al.* (2002). The maximum P uptake (40.60 kg ha⁻¹) was observed under M₄ treatment (4 t VC ha⁻¹) which was significantly more over to M₂ and M₁ but statistically at par with M₃. Similar results were also reported by Kanwar *et al.* (2002). Different organic manures did not reach to the level of significance in case of K uptake by cauliflower.

Economics:

The results of economics as influenced by organic manures indicated that treatment M₃ recorded the highest net realization (Rs. 1,51,967 ha⁻¹) with maximum BCR value of 6.09 while the lowest net realization was noticed under treatment M₂ (Rs. 1,26,894 ha⁻¹) with the BCR value of 5.30.

Effect of NPK levels:

It was observed from the results presented in Table 1 that curd yield, protein content and nutrient uptake were significantly influenced by different levels of NPK fertilizers.

Curd yield:

Among different inorganic fertilizer treatments, S₁ (100 % RDF) significantly produced the highest yield of curd (60.06 t ha⁻¹) over S₂ and S₃. The mean increased in curd yield under S₁ was to the tune of 8.2 and 22.4 per cent over S₂ and S₃, respectively. The role of nitrogen in increasing the yield is well understood as its application improved the plant vigour in the form of height, weight and number of leaves thus improved the photosynthetic efficiency and ultimately resulted yield of crop. These results are also in conformity with those observed by Kanwar *et al.* (2002), Mehdi *et al.* (2003), Sharma and Chandra (2004) and Singh *et al.* (2004).

Protein content:

The results on protein content in curd indicated that the application of 100 per cent RDF significantly increased the protein over 75 per cent RDF and STV. The role of nitrogen in the formation of protein and is an integral part of the chlorophyll molecule is well known. These results also corroborate the funding of Sharma and Chandra (2004).

Nutrient uptake:

Significantly the highest N, P and K uptake by curd

was recorded under 100 per cent RDF. An increase in uptake of major nutrients (NPK) by cauliflower curd under treatment 100 per cent RDF could be attributed to balanced application of nutrients improved curd yield and their higher concentration in the curd which ultimately helped in increase of their uptake by curd. These finding are also in agreement with Malewar and Indulkar (1993).

Economics:

The application of 100 per cent RDF (S₁) secured maximum net profit of Rs. 1,80,582 ha⁻¹ with BCR value of 8.19. The lowest net realization Rs. 1,29,764 ha⁻¹ was noticed under application of NPK as per soil test value with 7.56 BCR value.

Conclusion:

Based on above result it can be concluded that the cauliflower crop grown under middle Gujarat (India) condition should be fertilized with 200 kg N, 75 kg P₂O₅ and 37.5 kg K₂O ha⁻¹ along with vermicompost @ 3 t ha⁻¹ for getting maximum yield, protein, uptake of nutrients and economic return.

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