The Pharma Innovation Journal 2022; SP-11(9): 937-939

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(9): 937-939

www.thepharmajournal.com
Received: 16-06-2022
Accepted: 20-07-2022

Anjali Verma
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

D Tripathi
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

Ankush Mogta
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

Uday Sharma
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

Meera Devi
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

Corresponding Author:
Anjali Verma
Department of Soil Science and Water Management, Dr. Y S Parmer University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh, India

Influence of drip fertigation on yield and economics of cauliflower cv. PSBK- 1

Anjali Verma, D Tripathi, Ankush Mogta, Uday Sharma and Meera Devi

Abstract
The present studies were undertaken during 2013-14 and 2014-15 to investigate the influence of drip fertigation on yield and benefit cost ratio of cauliflower cv. PSBK-1. The field experiments were laid out in randomized block design with four replications and six fertigation levels (100, 90, 80, 70, 60 and 110 percent of recommended dose). Fertigation with recommended dose significantly, increased the curd weight and curd yield by 17.8 and 17.9 percent over 60% RD, and also this treatment had better water and nutrient utilization. Furthermore, fertigation applied in ten equal splits led to an optimum supply of nutrients to cauliflower at different growth stages thus leading to higher curd weight and yield. The highest benefit cost ratio (B:C) was recorded under 100 percent recommended dose (3.75:1) closely followed by 110 percent (3.56:1) while the lowest of 3.13:1 was recorded with 60% RD with the differences in benefits related to the higher marketable yield and nutrient availabilities. The study suggests that application of recommended dose of fertilizer through drip irrigation in 10 equal splits leads to higher and sustainable cauliflower production.

Keywords: Fertigation, drip system, nutrient availability, cauliflower yield and benefit cost ratio

Introduction
Enhancing the productivity is a prime objective to feed the ever growing population from shrinkage resources. There is an imperative need to produce more from less arable land and water. The continuous improvement in productivity with optimum utilization of water, fertilizer and natural resources is essential for sustainability of any production system. Apart from the economic considerations, the adverse effect of injudicious use of water and fertilizers can also have adverse implications on the environment. Hence, there is a need for technological interventions that will help in minimizing the use of precious resources (fertilizer and water) and maximizing crop production without any detrimental effects on the environment. Among the various techniques of water and nutrient application, the micro irrigation practices are very efficient and water conserving. The drip or trickle irrigation is important due to the many unique advantages it provides like conservation of soil moisture, optimum utilization of water resources, lesser wastage of nutrient, proper and sustained water and nutrient availability to the crop. It delivers water and nutrients directly to the root zone of the crop and water is applied in precise amount which synchronizes with the requirement of the crop. Application of plant nutrients by dissolving them in irrigation water with the drip system is termed as fertigation, prevents the leaching and volatilization losses of nutrients. The major advantages of fertigation are in saving of labour, appropriate timing of application of water and nutrients and their uniform distribution (Raina, 2002) [9]. Apart from other advantages like minimum leaching and volatilization losses, higher fertilizer use efficiency besides higher crop yields (Raina *et al.*, 2011) [8].

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is an important member of Cole crops and belongs to family Cruciferae. It is one of the most important winter vegetables of India. In India, cauliflower is grown on an area of 402 thousand ha with a production of 7887 thousand metric tonnes and productivity of 19.6MT/ha (NHB, 2013) [6]. Cauliflower is one of the important winter vegetable crop of mid hill region of Himachal Pradesh. The area under cauliflower cultivation in Himachal Pradesh as about of 79.5 thousand hectares with annual production of 1521.1 thousand metric tonnes and productivity of 19.1MT/ha (NHB, 2013) [6]. Drip irrigation is the most suitable method for uniform head size and high quality produce. In fact, it calls for total switch from conventional methods to efficient technique of irrigation and fertigation. In view of the aforestated facts, the present investigation was undertaken to study the influence of drip fertigation on yield and economics of cauliflower.

Methodology

The experiment was conducted at the experimental farm of Department of Soil Science and Water Management, Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during two crop year (2013-2015). It is located at 30º 51′ N latitude and 76º 11′ E longitude and an elevation of 1175 m above mean sea level having average slope of 7-8 percent. The study area falls in sub-temperate, sub-humid agro-climatic zone of Himachal Pradesh (zone-2). The soil (Eutrochrept) was gravelly sandy loam in texture and neutral in reaction. This experiment was laid out in Randomized block design with six treatments combinations and four replications (Gomez and Gomez 1984) [2]. The treatments comprised of six levels of nutrients through drip irrigation or fertigation viz. T_1 (100% of Recommended dose), T_2 (90% of Recommended dose), T_3 (80% of Recommended dose), T_4 (70% of Recommended dose), T_5 (60% of Recommended dose), T_6 (110% of Recommended dose). The recommended dose of FYM was applied before start of experiment. Recommended doses of N, P and K are 125, 108 and 76kg/ha, respectively for cauliflower in Himachal Pradesh. Fertigation was done through venturi in 10 equal split applications at 10 days interval. The water soluble fertilizer (WSF-19:19:19) was used for fertigation. To meet the NPK requirement of different treatments, WSF was supplemented with urea and murate of potash (MOP). After each fertigation, drip system was thoroughly flushed for 5 minutes. Different doses of fertilizers were applied by regulating the supply with the help of closing and opening knobs put at appropriate places. The size of experimental plot was 5 m x 1.8 m with spacing of 60 cm x 45 cm. The cost of cultivation was worked out considering sum of fixed cost (land revenue, depreciation, rental value of land and interest on fixed capital) and variable cost (labour cost, material cost and interest on working capital). Further benefit cost ratio was calculated by following formula. The observations were recorded on different quantitative characters of cauliflower, viz. curd weight and curd yield. Curd yield (qha^{-1}) was calculated from the weight of curds obtained per plot (kg). The data recorded for various parameters under field experiments were subjected to statistical analysis using randomized block design (RBD) and treatment means were separated by critical difference at 5% level of significance (Gomez and Gomez 1984) [2]. The benefit cost ratio was calculated by considering the cost of variable as well as fixed inputs and prevailing market rates, the expenditure incurred on various inputs and operations. Simultaneously, gross returns were worked out for each treatment based on quality and market prices of the produce. The net returns were worked out by deducting the cost incurred from the gross returns of the particular treatment.

Benefit Cost Ratio = Gross Return (Rs/ha)/Total Cost (Rs/ha)

Results and discussion

The plant parameters of cauliflower i.e, curd weight and yield were significantly influenced by different levels of fertigation (Table1). The curd weight is an important parameter that determines the commercial viability and acceptability of a variety and is one of the most important traits attaining highest consideration in research programs. Application of recommended level of nutrients T_1 i.e.100% of recommended dose produced maximum (873.8 g $plant^{-1}$) curd weight which was at par with T_6 i.e.110% of recommended dose (844.4 g $plant^{-1}$). A comparision of data among different fertigation level reveals that T_1, T_2, T_3, T_4, T_5 and T_6 registered curd yield in the tune of 291.0, 274.5, 266.5, 254.3, 246.9 and 281.2q ha^{-1}, respectively. The increase in curd yield was noted to be 18 percent higher under 100% RD treatment over to 60% RD treatment. These results suggested that increasing level of fertigation significantly improved the curd yield. Significantly higher yield under 100% RD treatment may be attributed to much better water and nutrient utilization as nutrients were applied in ten equal splits. These fractionated supplies in optimum nutrient concentration might have met the nutrient requirement of cauliflower at various growth stages thus leading to higher curd weight and yield. Kapoor *et al.* (2014) [3], Sathya *et al.* (2008) [10] and Brahma *et al.* (2010) [1] observed significantly higher yield of tomato on fertigation. Similar observations were also made by Patel and Rajput (2003) [6] in broccoli. Yanglem and Tumbare (2014) [11] have also made the similar findings and attributed to such effect at higher fertigation level, crop meet out its nutritional requirement at respective growth stage which lead to luxurious growth and there by enhancement of yield in cauliflower.

Table 1: Influence of drip fertigation on net curd weight and curd yield of cauliflower

Treatments	Curd weight (g $plant^{-1}$)	Yield (q ha^{-1})
T_1 (100% of Recommended dose through drip)	873.8	291.0
T_2 (90% of Recommended dose through drip)	825.5	274.5
T_3 (80% of Recommended dose through drip)	800.3	266.5
T_4 (70% of Recommended dose through drip)	763.8	254.3
T_5 (60% of Recommended dose through drip)	741.4	246.9
T_6 (110% of Recommended dose through drip)	844.4	281.2
CD(0.05)	41.64	13.92

The present investigation, in table 2 reveals that maximum gross income was recorded in T_1 i.e. 100% of Recommended dose (Rs 436500) followed by T_6 i.e. 110% of Recommended dose (Rs 421800), T_2 i.e. 90% of Recommended dose (Rs 411750) and minimum (Rs 370350) under T_5 i.e. 60% of Recommended dose through drip fertigation. Similarly, net returns were maximum (Rs 34451.84) under T_1 i.e. 100% of Recommended dose followed by T_6 i.e. 110% of Recommended dose (Rs 329269.95), T_2 i.e. 90% of Recommended dose (Rs 320325.68) and minimum (Rs 280584.30) under T_5 i.e. 60% of Recommended dose through drip fertigation. The highest benefit cost ratio (3.75:1) was worked out in treatment T_1 i.e. 100% of Recommended dose which was rated as the most profitable and cost effective fertigation followed by T_6 i.e. 110% of Recommended dose (3.56:1) and T_2 i.e. 90% of Recommended dose (3.50:1), whereas, lowest benefit cost ratio was recorded under T_5 i.e. 60% of Recommended dose through drip fertigation (3.13:1). Hence, application of nutrients as 100% RD through drip irrigation in splits can be used for maximizing the cauliflower

yield.

Comparatively, higher B:C ratio under T_1 (100% of Recommended dose) may be due to higher marketable yield and nutrient availabilities. The treatments T_6 and T_2 were also found to be superior over other treatments which may also be attributed to the higher yields and favorable soil environment. Though the crop yield did not differ significantly under T_1 and T_6 but quantum of fertigation applied, was highly different which lead to the slight variation in B:C ratio under these treatments. These results are in agreement with those of Kapoor *et al.* (2014) [3]; Raj *et al.* (2015) [7] and Khan *et al.* (1999) [4].

Table 2: Cost economics of different drip fertigation treatments in cauliflower

Treatments	Fixed cost (Rs)	Variable cost (Rs)	Total cost of cultivation (Rs/ha)	Yield (q/ha)	Gross Income (Rs/ha)	Net Returns (Rs/ha)	B:C Ratio
T_1	14102.15	77882.02	91984.16	291.0	436500	344515.84	3.75:1
T_2	14102.15	77322.17	91424.32	274.5	411750	320325.68	3.50:1
T_3	14102.15	76767.59	90869.73	266.5	399750	308880.27	3.40:1
T_4	14102.15	76218.14	90320.28	254.3	381450	291129.72	3.22:1
T_5	14102.15	75663.56	89765.70	246.9	370350	280584.30	3.13:1
T_6	14102.15	78427.91	92530.05	281.2	421800	329269.95	3.56:1

Conclusion

On the basis of above study, it may be concluded that application of 100% RD of nutrients in ten splits through drip irrigation was found better in curd yield and benefit cost ratio over rest of the fertigation treatments. Compared with other treatments, use of 100% RD through fertigation resulted in significantly greater availability of nutrients, as also that contributed to higher yield of cauliflower. Therefore, it may be concluded that drip fertigation of 100% cent recommended dose of fertilizers at ten days interval is an ideal practice to achieve higher and sustainable cauliflower production.

Acknowledgements

Authors are thankful to the institute for provide all kinds of permission and financial support required during the study.

References

1. Brahma S, Borbora DP, Kachari M, Hazarika TK, Das K. Growth, yield and economics of broccoli under different levels of nitrogen fertigation. Indian Journal of Horticulture. 2010;67:279-282.
2. Gomez, Gomez. Statistical procedures for agricultural research, John Wiley and sons, 1984, 627.
3. Kapoor R, Sandal SK, Sharma SK, Kumar A, Saroch K. Effect of varying drip irrigation levels and NPK fertigation on soil water dynamics, productivity and water use efficiency of cauliflower (*Brassica oleracea* var. *botrytis*) in wet temperate zone of Himachal Pradesh. Indian Journal of Soil Conservation. 2014;42(3):249-254.
4. Khan HA, Krishna MM, Kariyanna R, Sreerama R, Biradar M. Effect of sources and levels of fertigation on productivity of tomato. In: Proc. Natn. Sem. On Problems and Prospectus of micro and sprinkler Irrig.; A critical Apprisal, held on 19-20, at Bangalore, India, 1999, 213p.
5. NHB. Annual production of vegetable. National Horticulture Board, 2013.
6. Patel N, Rajput TBS. Yield response of some vegetable crops to different levels of fertigation. Annals of Agricultural Research. 2003;24:542-45.
7. Raj BHR, Joshi M, Vishaka GV. Effect of surface fertigation on nutrient uptake, fertilizer use efficiency and economics of inter - specific hybrid Bt Cotton. Universal Journal of Agricultural Research. 2015;3(2):46-48.
8. Raina JN, Sharma, Tarika, Shashi Suman. Effect of drip fertigation with different fertilizers on nutrient distribution in soil, leaf nutrient content and yield of apricot (*Prunus armeniaca* L.). Journal of the Indian Society of Soil Science. 2011;59:268-277.
9. Raina JN. Drip irrigation and fertigation: Prospects and Retrospect's in temperate fruit production: In: Enhancement of temperate fruit production in changing climate. Ed(s) K. K., Jindal and D. R., Gautam. University of Horticulture and Forestry, Solan, 2002, 296-301.
10. Sathya S, Pitchai JG, Indirani R, Kannathasan M. Effect of fertigation on availability of nutrients (N, P& K) in soil-A Review Agricultural Reviews. 2008;29(3):214-219.
11. Yanglem SD, Tumbare AD. Influence of irrigation regimes and fertigation levels on yield and physiological parameters in cauliflower. An International Quarterly Journal of Life Sciences. 2014;9(2):589-594.